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AN EVALUATION OF OILSEED TRADE LIBERALIZATION

Agriculture and Agri-Food Canada

July 1998

AN EVALUATION OF OILSEED TRADE LIBERALIZATION

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Preface

This report is part of the Trade Research Series that Agriculture and Agri-Food Canada (AAFC) is undertaking to support discussions in connection with multilateral and bilateral trade negotiations. The purpose of the series is to create an inventory of research that will make it easier for stakeholders to identify concerns, issues and opportunities associated with such discussions. The research is for the most part directed to areas in which little or no information has been circulated rather than to areas in which a broad base of literature already exists. More information on the Trade Research Series is available on the AAFC website at *www.agr.ca/policy/epad*, or by contacting Brian Paddock, Director of the Policy Analysis Division, Policy Branch (e-mail: *Paddobr.em.agr.ca*, phone: *(613) 759-7439*).

This report is a joint undertaking by the Policy Branch and the Market and Industry Services Branch of AAFC, in conjunction with a team of representatives from the Canadian oilseed industry. Professor Karl Meilke from the University of Guelph was engaged as a consultant to conduct the analysis. This report summarizes the main findings. A separate Summary Report, which caters to a less technical audience, is also available in this Trade Research Series.

The study has made use of the AGLINK commodity model which was developed by the Secretariat of the Organization for Economic Cooperation and Development (OECD). The OECD Secretariat wishes to note to readers of this document that:

> "...the Secretariat can not be held responsible for results obtained from applications of the (AGLINK) model, or derivative versions of the model, by outside individuals. The results of any analysis based on the use of the AGLINK model by parties outside the OECD are not endorsed by the Secretariat. It would therefore be inappropriate for outside users to suggest or to infer that these results, or interpretations attached to these results, can in any way be attributed to the OECD Secretariat or to the Member countries of the Organisation."

Introduction

In agriculture, the oilseeds and oilseed products sector is one of the commodity sectors which is least influenced by government intervention. Due to the limited level of government intervention this sector may be well positioned for international policy reform.

The potential for reform was apparent near the end of the Uruguay Round (UR) of trade negotiations when a proposal for liberalizing oilseed and oilseed product (vegetable oil and meal) trade was put forward. Although the proposal, which was aimed at reducing import tariffs and export subsidies to zero (zero-for-zero), received considerable support, it was not adopted.[1]

Since the end of the UR, the zero-for-zero proposal continues to attract interest from producers and processors of oilseeds. With new agri-food trade negotiations scheduled to begin in 1999, oilseed and oilseed product trade may become one of the areas of focus for trade liberalization.

While there is support for liberalized trade in oilseeds and oilseed products in Canada, there is still debate within the sector concerning the consequences of the proposal. There is a general consensus that quantitative assessment should be undertaken before a further commitment to liberalization can be expected from the industry.

Objective

The objective of this study is to provide a quantitative assessment of oilseed and oilseed product trade liberalization. In order to achieve this objective the AGLINK model developed by the Organization for Economic Cooperation and Development (OECD) is used as a starting point. The AGLINK model is extended and modified to provide a more comprehensive analysis of oilseed and oilseed product trade liberalization than was carried out by Meilke and Jay (1997).

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[1] The quantitative analysis involves only tariff removal scenarios since direct export subsidies are small enough to be safely ignored.

The main questions to be addressed by the quantitative assessment are the effects of liberalization on:

- world and domestic prices of oilseeds and oilseed products;
- the supply and disposition of oilseed and oilseed products in major producing and consuming regions;
- the income effects in major producing and consuming regions; and
- the level of processing (crushing) activity in countries with significant processing capacity.

In addition to quantifying these impacts, sensitivity analysis is required to determine how the results are affected by different parameter assumptions. A preliminary assessment is also undertaken of the steps needed to analyse the removal of domestic support (zero-zero-zero) in the oilseed and oilseed product sector.

Chapter 1: Model Refinements

In order to use the OECD AGLINK model for oilseed policy analysis a number of modifications and improvements were undertaken.[1] This section describes these changes.

Commodity Aggregation

Aggregation is almost always required in empirical economic analysis. Aggregation takes place over consumers, geographic areas and commodities. For this study, the issue of commodity aggregation is of most importance. AGLINK combines soybeans, rapeseed and sunflower seed into a single oilseed commodity aggregate. Oilseed oil and oilseed meal derived from the three oilseeds are combined in a similar fashion. Green (1978) has shown that commodity aggregation is consistent with the consumer allocation problem only when the prices of the commodities in the aggregate adhere to the "composite commodity theorem." The composite commodity theorem states that commodities can be aggregated when the relative prices of goods in a group are constant. In the real world, few price relatives are exactly constant, so the problem of commodity aggregation is essentially an empirical issue.

The OECD in constructing the AGLINK model felt that the three oilseeds and their products were sufficiently similar in end use, and relative prices sufficiently constant to justify aggregation. This decision is consistent with most of the empirical studies of the international oilseed market where seldom is more than one oilseed or oilseed aggregate explicitly modelled. However, the composite commodity theorem suggests that when commodities are aggregated, any one commodity price can be used to represent the price of all commodities in the group, or an index number which is homogeneous of degree one in the prices can also be used. AGLINK is not entirely consistent with this concept. A variety of price indices for the oilseed commodity aggregate are used. In some cases, the price of an individual oilseed, in the commodity aggregate, is generated from a price linkage equation. Additional variables are included in the price linkage equation to account for departures of this commodity's price from the oilseed price index. These departures, which no doubt occur in the empirical data, are inconsistent with the composite commodity theorem.

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[1] The reader requiring an introduction to modeling issues involving joint products is referred to Meilke and Jay (1997).

In the planning stage for this study, considerable thought was given to the issue of commodity aggregation and its potential impact on the empirical results. In the end, two pragmatic decisions were made. First, the soybean, sunflower and rapeseed aggregation is maintained. The parameter estimates required to separate the three oilseeds do not exist in the literature, and the task of estimating the required parameters implies a major research effort. Second, another vegetable oil, palm oil, was introduced into the analysis. Palm oil is a significant substitute for the other vegetable oils in many markets. The inclusion of palm oil in the analysis extends the coverage of AGLINK so that most of the economic activity in the vegetable oil sector is included in the model.[1]

The policy implications of the analysis for individual commodities are difficult to determine due to the level of aggregation. If tariffs were equal across all oilseeds and all markets, and the oilseeds and their products were perfect substitutes for each other, then tariff removal would not influence relative prices among the oilseeds and the "average" effect of the tariff removal would apply to each commodity.[2] However, the oilseeds are not perfect substitutes for one another and tariffs across commodities are not always the same. Hence, some differential and most likely larger impacts for individual commodities could be observed. For canola, which is of particular interest to Canada, oil tariffs imply higher effective protection for canola oil processing than for soybean processing. Hence, the removal of oil tariffs may result in larger shifts in canola oil processing capacity than for soybean processing capacity. However, a careful empirical answer to the differential impacts of tariff removal requires a much larger research effort than is possible given the budget and time allocated to complete this study.

A decision also had to be made about aggregation across countries and regions. For this analysis the OECD modules for the major oilseed producing and consuming regions were maintained (Australia, Canada, European Union, Japan, Mexico, United States, Rest of World [ROW]) and modified as discussed in "Estimation Procedures and Parameter Estimates" on page 3. The ROW region in AGLINK was disaggregated into four regions: Brazil, Argentina, China and a new ROW region. Brazil and Argentina represent two of the world's largest oilseed and oilseed product exporting countries. China represents a huge oilseed market and the new ROW contains many of the world's significant importers. Eight small countries are treated exogenously in the AGLINK oilseed sector and this delineation is maintained.

Data

Three types of data were required to complete the study. First, AAFC obtained supply–disposition data from the Food and Agriculture Organization (FAO) and the U.S. Department of Agriculture. Second, since no domestic price information was readily available in the new regions, all supply and demand prices were assumed to equal world prices, adjusted by tariffs where necessary. For Argentina and Brazil, the United States' soybean and products price was used as the indicative world price, while for China and the ROW, European weighted average prices of soybean, rapeseed and sunflower seed were used as the indicative price. Third, AAFC compiled tariff information for all of the regions.

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[1] In 1996, total oil production was 73,328 mmt, of which 20,499 mmt (28%) was soyoil, 16,687 mmt (23%) was palm oil, 10,492 mmt (14%) was rapeseed oil and 8,774 mmt (12%) was sunflower seed oil.

[2] This statement is only strictly true if tariffs are ad valorem. Effective rates of protection differ greatly across oilseeds and countries (Meilke and Jay, 1997).

The procedure used by AAFC to calculate the tariffs in each region is outlined in Appendix A and the results of these calculations are presented in Appendix B. Table 1 on page 6 shows the tariffs that were included in the baseline run of AGLINK for each of the years 1996 to 2001.[1] All tariffs, with the exception of the Japanese oilseed oil tariff, are entered into the model as *ad valorem* tariffs.

Estimation Procedures and Parameter Estimates

For the original regions in AGLINK new parameter estimates were required for:

- The oilseed oil demand equations to incorporate the cross price elasticity between the demand for oilseed oil and palm oil.
- The crush demand equations to incorporate a variable representing the crushing margin.
- The oil, meal and seed stock demand equations to incorporate a revised specification for these equations.

For each of the four new regions in the model, parameter estimates were required for the behavioural equations in each country module. Finally, equations were added to endogenize the palm oil market.

A complete description of the revised and new country modules are in Appendices C through M. Only a summary of the procedures and results are presented in this chapter. Given the time available to complete the tariff analysis, it was necessary to dispense with detailed econometric analysis. Consequently, all of the country/region modules are similar in structure and were developed to be consistent with the specifications used for other commodity sectors in AGLINK. At the same time, the oilseed module is constructed to take account of the joint product nature of oilseed oil and oilseed meal.

All the behavioural equations were estimated using ordinary least squares. These estimates, which were often obtained using short sample periods and incomplete data, were judged against an informal set of *a priori* parameter expectations.[2] In most cases, where there was a divergence between the prior expectations and the statistical estimates, the difference was resolved in favour of the informed judgement contained in the priors. For this reason, the oilseed block of AGLINK should be thought of as a simulation model, rather than a carefully estimated commodity market model. The realism of the policy analysis hinges on the soundness of the parameter choices embedded in the model. We feel confident that most analysts will find the parameter choices acceptable, and hence have faith in the outcome of

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1. The specific Japanese vegetable oil tariff was 17,000 yen/mmt until 1995 when the tariff reductions agreed to in the UR of trade negotiations began. The UR tariff reductions are incorporated into the base simulation for Japan.
2. The study by Meilke and Jay (1997) contains a detailed review of parameter estimates found in the oilseed literature.

the tariff analysis. The parameter choices are presented below along with a brief discussion. Cases where there was only weak statistical support for the final estimates are given special attention.

Oilseed Oil Demand Elasticities

Table 2 on page 7 shows the elasticities used in the oilseed oil demand block of AGLINK. Direct price elasticities range from -0.20 to -0.50, with the exception of Mexico where demand is more price elastic (-0.95). The cross price elasticities with respect to palm oil tend to be very small. For the most part, the econometric support for a statistically significant substitution relationship between vegetable oils and palm oil was extremely weak. Income elasticities range from 0.20 to 1.20, but these estimates play no role in the policy analysis since income is an exogenous variable in AGLINK. All the demand functions are linear in the logarithms of the variables and hence impose a constant elasticity assumption.

Crush Demand Elasticities

The crush demand functions in AGLINK were all re-specified so that crushing reacts to the gross crush margin i.e., the margin above the cost of the seed. The crush demand functions were constrained to impose the short and long run elasticities, with respect to the crushing margin, shown in Table 3 on page 7.

The short-run crush demand elasticities range from a low of 0.20 in the European Union to a high of 0.50 for Australia, Canada and the United States. In the long-run, the European Union is by far the most price-inelastic market at 0.20. The most elastic long-run crush demands are found in Canada and the United States. The econometric estimates of crush demand elasticities are generally much more inelastic than those shown above. However, the econometric estimates are constrained to reflect a fixed crush capacity. In the longer run, new capacity can be constructed and old plants shut down. For that reason, the estimates shown above are quite reasonable, and in fact may be too small in the long run.

Meal Demand Elasticities

In AGLINK, the demand for oilseed meal depends on the number of animals being fed and the price of oilseed meal, coarse grains and wheat. Table 4 on page 8 shows the price responsiveness of oilseed meal demand in the four regions added to the AGLINK model. For comparison purposes, the parameter estimates for six of the original AGLINK regions are also shown in Table 4.

The oilseed meal direct price elasticities in the new regions are all constrained to equal -0.25 except for the demand in Argentina which is much more price elastic at -1.31.[1] Coarse grains are a complement for oilseed meal in Brazil, Argentina and the ROW but a substitute for oilseed meal in China. Wheat is a substitute for oilseed meal in Brazil, Argentina and the ROW but a complement for oilseed meal in China. Given the specification of the oilseed meal demand equations used in AGLINK, livestock prices do not directly effect oilseed meal demand. The influence of livestock prices is only through its effect on animal numbers. Oilseed meal demand is homogeneous of degree zero in terms of oilseed meal, coarse grain and wheat prices.

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[1] There is no livestock module for the new regions added to AGLINK. For this reason the meal demand in the new regions are linked to the livestock component of the original AGLINK ROW region. Hence, using the original parameter estimates made sense. However, in Argentina meal demand appeared to be much more price elastic than in the ROW region. Similarly, in China coarse grains appeared to be a substitute rather than a complement for oilseed meal.

Area Response

The short-run and long-run response of oilseed area in the four new AGLINK regions is shown in Table 5 on page 8.

The supply elasticities are uniformly inelastic in both the short and long-run. However, these are total elasticities, since no competing products price has been included in the equations and this implies a more price inelastic response.

Stock Demand Elasticities

Equations representing the stock demand for oilseed oil, oilseed meal and oilseeds were re-specified in the model for the old regions and the four new regions. However, the specification adopted remains true to the conceptual framework used in AGLINK. The major change is to replace the "world" stock level equation with regional equations. In the regional functions the carry-out stocks in any region, relative to world production, is assumed to be a function of the current world price level, relative to the average price in the previous four years, regional production and a time trend (See equation below).

$$Ln\left(\frac{ST_i}{WLDPROD}\right) = \alpha + B_1$$

$$\times Ln((WP_t)/(0.25 \times WP_{t-1} + 0.25 \times WP_{t-2} + 0.25 + WP_{t-3} + 0.25 \times WP_{t-4})) + B_2 \times Ln(PROD_i) + B_3 \times Ln(TIME)$$

This function implies that stock levels in a particular region (St_i) move proportionally with world production levels, while a particular region's stock holding, relative to world production levels, can vary depending on local production and over time. The same specification of stock demand was employed for each commodity and in each region. In many cases, the local production variable and/or the time trend was insignificant and dropped from the final specification.

The elasticity estimates for oilseed oil stocks are shown in Table 6 on page 9. The price responsiveness of oilseed oil stocks is most price elastic in Canada (-1.00) and the United States (-0.80) but considerably smaller in the other regions.

The estimates of oilseed meal stock demand elasticities are shown in Table 7 on page 9. Meal stock demand is uniformly very price inelastic with most of the price coefficients constrained to equal -0.20.

The oilseed stock demand elasticities are shown in Table 8 on page 10. Oilseed stock demand elasticities range from approximately 1.00 in the European Union and the United States to rather price inelastic responses in Japan, China, Argentina and ROW.

Table 1: Tariff Levels, by Region and Year, Used in the Tariff Elimination Simulations

Region	Variable Code	Units	Tariff Level By Year					
			1996	1997	1998	1999	2000	2001
Argentina Oilseed Oil	argoltar	percent	-1.35	-1.35	-1.35	-1.35	-1.35	-1.35
Argentina Oilseed	argostar	percent	-3.50	-3.50	-3.50	-3.50	-3.50	-3.50
Australia Oilseed Oil	ausoltar	percent	5.00	5.00	5.00	5.00	5.00	5.00
Brazil Palm Oil	braoltar	percent	10.00	10.00	10.00	10.00	10.00	10.00
Canada Palm Oil	canpltar	percent	8.32	7.84	7.36	6.88	6.40	6.40
China Oilseed Oil	choltar	percent	19.00	19.00	19.00	19.00	19.00	19.00
China Palm Oil	chpltar	percent	9.00	9.00	9.00	9.00	9.00	9.00
European Union Palm Oil	e15pltar	percent	5.00	5.00	5.00	5.00	5.00	5.00
Japan Oilseed Oil	jpnoltar	000 yen/mt	14.96	13.94	12.92	11.90	10.90	10.90
Korea Oilseed Meal	koroltar	percent	2.0	2.0	2.0	2.0	2.0	2.0
Mexico Palm Oil	mexpltar	percent	10.00	10.00	10.00	10.00	10.00	10.00
ROW Oilseed Oil	rwoltar	percent	17.70	17.70	17.70	17.70	17.70	17.70
ROW Oilseed Meal	rwomtar	percent	5.60	5.60	5.60	5.60	5.60	5.60
ROW Oilseed	rwostar	percent	10.70	10.70	10.70	10.70	10.70	10.70
ROW Palm Oil	rwpltar	percent	14.40	14.40	14.40	14.40	14.40	14.40
Taiwan Oilseed Meal	taiomtar	percent	8.40	8.40	8.40	8.40	8.40	8.40
World Oilseed Oil*	wldoltar	percent	10.20	10.20	10.20	10.20	10.20	10.20
World Palm Oil*	wldpltar	percent	11.80	11.80	11.80	11.80	11.80	11.80

* These are the weighted average tariff levels for all oil importing nations. These values are used only in the palm oil reduced form equations.

Table 2: OILSEED OIL DEMAND ELASTICITIES

	Elasticities			
	Direct Price	Palm Price	Other Price	Income
Argentina	-0.30			1.20
Australia	-0.50			0.20
Brazil	-0.30	0.05		0.50
Canada	-0.35	0.10	0.10	0.50
China	-0.20	0.05	0.10	0.47
European Union	-0.50	0.20		1.00
Japan	-0.20		0.05	0.60
Mexico	-0.95	0.20	0.15	0.25
ROW	-0.25	0.18		0.77
United States	-0.30	0.05		0.40

Table 3: CRUSH DEMAND ELASTICITIES

	Margin Elasticities	
	SR	LR
Argentina	0.30	0.60
Australia	0.50	0.63
Brazil	0.30	0.60
Canada	0.50	1.00
China	0.30	0.60
European Union	0.20	0.20
Japan	0.30	0.60
ROW	0.30	0.60
United States	0.50	1.00

Table 4: OILSEED MEAL DEMAND ELASTICITIES

	Price Elasticities		
	Meal	Coarse Grains	Wheat
Argentina	-1.31	-0.45	1.76
Australia	-0.79	0.44	0.35
Brazil	-0.25	-0.21	0.46
Canada	-0.37	-0.25	0.62
China	-0.25	0.50	-0.25
European Union	-0.25	0.00	-0.07
Japan	-0.20	0.15	0.05
Mexico	-0.42	0.38	0.04
ROW	-0.25	-0.21	0.46
United States	-0.12	0.04	0.08

Table 5: OILSEED AREA RESPONSE ELASTICITIES

	Direct Price Elasticities	
	SR	LR
Argentina	0.20	0.25
Brazil	0.35	0.55
China	0.20	0.28
ROW	0.20	0.31

Table 6: OILSEED OIL STOCK DEMAND ELASTICITIES

	Elasticities		
	Direct Price		Production
	SR	LR	
Argentina	0.50	-0.40	—
Australia	no stocks		
Brazil	-0.50	-1.00	—
Canada	-1.00	-1.00	—
China	no stocks		
European Union	-0.50	-0.50	—
Japan	-0.20	-0.20	—
Mexico	no stocks		
ROW	-0.30	-0.43	0.44
United States	-0.80	-1.77	0.55

Table 7: OILSEED MEAL STOCK DEMAND ELASTICITIES

	Elasticities		
	Direct Price		Production
	SR	LR	
Argentina	-0.20	-0.20	—
Australia	no stocks		
Brazil	-0.20	-0.20	—
Canada	-0.20	-0.20	—
China	no stocks		
European Union	-0.20	-0.43	—
Japan	-0.20	-0.20	8.10
Mexico	no stocks		
ROW	-0.20	-0.20	—
United States	-0.50	-0.50	—

Table 8: OILSEED STOCK DEMAND ELASTICITIES

	Elasticities		
	Direct Price		Production
	SR	LR	
Argentina	-0.20	-0.20	—
Australia	no stocks		
Brazil	-0.50	-0.50	0.34
Canada	-0.50	-0.50	—
China	exogenous		—
European Union	-1.00	-1.00	2.10
Japan	-0.20	-0.20	0.16
Mexico	no stocks		
ROW	-0.20	-0.20	2.68
United States	-1.17	-1.46	1.04

Chapter 2: Tariff Removal Analysis

The objective of this study is to analyse the effects of removing tariffs in the oilseed and oilseed product market on the oilseed sector. In order to meet this objective six different experiments are conducted. The experiments are organized so that in the first four cases only one set of tariffs is removed at a time. This makes it easier to form *a priori* expectations on the expected movements of the endogenous variables and to compare these expectations with the model outcomes. The differences between the *a priori* expectations and the model outcomes may indicate errors in the model structure or data, or simply illustrate the complex interaction of the large AGLINK modelling structure. However, if the results are counter–intuitive it should be possible to explain why seemingly perverse results are obtained. In the fifth experiment the tariffs on all oilseed and oilseed products are eliminated and this experiment corresponds to the model's prediction of a zero-for-zero policy situation. Since tariffs are being eliminated on all products, in various countries, it is extremely difficult to form strong *a priori* expectations of the direction of change of key endogenous variables. In the sixth experiment the effects of removing only the Japanese oilseed oil tariff are presented. These results are compared to the results obtained by Meilke and Jay (1997) who conducted a similar experiment. The differences between the results of Meilke and Jay (1997) and the ones obtained in this analysis flow entirely from the revised specification of the AGLINK model.

In the next six sections, the results for the following tariff removal experiments are discussed:

1. The removal of the tariffs on soybean oil, rapeseed oil and sunflower seed oil.
2. The removal of the tariff on palm oil.
3. The removal of tariffs on soybean meal, sunflower seed meal, and rapeseed meal.
4. The removal of oilseed tariffs on soybeans, rapeseed and sunflower seed.
5. The removal of all tariffs on soybeans, rapeseed and sunflower seed and their products, as well as palm oil; and 6) the removal of the oilseed oil tariff in Japan.

Each tariff removal simulation is conducted over the period 1996 to 2001. The model is first simulated with tariffs at their current levels over the 1996-2001 time period.[1] This generates a set of baseline values. For each experiment the tariff(s) are removed and a new simulation over the 1996 to 2001 time period is obtained. The results of this simulation are compared to the results from the original baseline simulation, and the difference between the two simulations illustrates the effects of the tariff removal. For each simulation the base values in 1996 and 2001 are presented, along with the unit and percentage changes from the base levels resulting from the tariff removal. The results are illustrated in tabular form for 77 of the most important endogenous variables. These include oilseed oil consumption, oilseed meal consumption, oilseed crush, oilseed production, oilseed oil prices, palm oil prices, oilseed meal prices and oilseed prices for the large regions in the model. In addition, an index number for processing revenue is calculated for each region. Processing revenue is calculated as the value of oilseed oil and meal products less the cost of the oilseed, times the total quantity crushed. This amount is indexed to equal 100 in 1996.[1] Similarly, an index of gross revenue earned by oilseed producers in each region is calculated. This involves multiplying the production of each oilseed times the farm level price. Again, this amount was converted to an index number with 1996 equal to 100.[2]

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[1] In some cases, the phased tariff reductions agreed to in the UR are incorporated into the baseline simulation.

Oilseed Oil Tariff Elimination

Table 9 on page 17 shows the simulation results for the removal of tariffs on soybean oil, rapeseed oil and sunflower seed oil. The results for 1996 are short-run results, where total oilseed production is essentially unchanged. The results for 2001 show midterm results where supply response can take place. In this simulation, oilseed oil tariffs in Australia (5%), China (19%), Japan (14,960 yen/mt) and ROW (17.7%) were removed. Before proceeding to the results, it is useful to document the expected changes in the endogenous variables. These are:

- Oilseed oil consumption increases in those regions which have removed an oilseed oil tariff and decreases in those regions that were tariff free at the baseline.
- Oilseed meal consumption increases in all regions.
- Oilseed crush decreases in those regions that remove their oilseed oil tariff and increases in all other regions.
- Oilseed oil price decreases in those regions that remove tariffs and increases in all other regions.
- Palm oil price decreases.
- Oilseed meal price decreases in all regions.
- Oilseed price changes that cannot be determined *a priori* based on the comparative statics presented by Meilke and Jay (1997).
- Processor crushing revenue decreases in those regions that remove oil tariffs and increases in those regions that were tariff free.

---

[1] An index number is used instead of a currency value for two reasons. First, in many regions, local prices are not available and the "world" values used in the crushing margin are only indicative of local crushing margins. Second, in China and the ROW, it was necessary to add $50/mt to the crushing margin calculated using world prices to keep it from becoming negative during simulations. The same was true in Japan where 5,000 yen/mt was added to the crushing margins. For these regions the raw crushing margin values are misleading. The exception is Canada where dollar values are reported.

[2] An index of gross producer revenue is used instead of currency values because local producer values were not available in many regions. The exception is Canada where dollar values are reported.

- Producers' gross revenue increases or decreases depending on whether seed prices increase or decrease.

Table 9 also shows the results of removing the tariffs on vegetable oil. In discussing the results, the focus is on the 2001 values which allow for a supply response in the various regions.

Vegetable oil tariffs were removed in Japan, China and the ROW. Consumption in each of these regions increases by 1.8%, 1.45%, and 2.5%, respectively. Vegetable oil consumption falls in all other regions with Canada's decline equalling 2.4%. As expected, meal consumption increases in all regions but by relatively small amounts, in no case exceeding 1%. Vegetable oil crush declined in those regions that removed their vegetable oil tariff because of lower effective protection to the oilseed sector. The largest decline was in Japan which faced a 20.4% decline in oilseed crushing. Oilseed crushing also declined in China (11.5%) and in the ROW (12.3%). Oilseed crush increased in all other regions with the largest increase occurring in Canada (11.2%). Changes in oilseed production were minimal, the largest increase being in Canada where oilseed output increased by about 1%.

As expected, vegetable oil prices declined by about 9% in those regions removing tariffs. World vegetable oil prices increased by 7.5% as a result of the tariff removals. Palm oil prices declined by about $20 per metric ton in 1996 as consumption shifted away from palm oil. However, by 2001 palm oil prices rose relative to the baseline and in fact returned to their baseline values after five years. Oilseed and meal price changes were minimal, declining by about 0.5% in both 1996 and 2001. Oilseed prices declined in 1996 but by 2001 were slightly higher than baseline amounts. The largest oilseed price increase is in Canada where price goes up by 1.4%.

As a result of the tariff removals and price changes, crushing revenue in all regions increases except for those that have removed vegetable oil tariffs. The largest increase is in the European Union where crushing revenue increases by 42.9% by 2001. Crushing revenue in Canada increases by 24.3% in 2001. Producers' gross production revenue also increases in every region. The largest increase is in Canada where by the end of the sample period revenues are up by 2.4% or $70.6 million. The only other significant revenue increase is in the European Union where gross production revenue increases by 5.6%.[1]

To summarize, all the price and consumption changes are in the expected directions and oilseed producers benefit from the tariff reductions in all regions. Oilseed processors gain in all regions except those that have removed their oilseed oil tariff.

Removal of Palm Oil Tariffs

Table 10 on page 21 shows the effects of removing palm oil tariffs only. All other tariffs are maintained at their baseline values. Palm oil tariffs affect oilseed oil consumption in some but not all regions in the model. In addition, palm oil tariffs vary from a low of 5% in the European Union to a high of 14.4% in the ROW. The removal of the palm oil tariff increases world palm oil prices by just over 11% in both 1996 and 2001. Surprisingly, the rearrangement of vegetable oil demand and prices results in vegetable oil prices increasing minimally, about 0.5% in 2001. This result can be explained by the fact that several large vegetable oil consumption regions either have no palm oil tariff (United States, Japan, Argentina) or palm oil tariffs (European Union, China, Canada) are smaller than the world palm oil price increase. In these regions, vegetable oil demand increases and more than offsets the decline in consumption in other regions. This causes the world oilseed oil price to rise marginally. Changes in oilseed and meal prices, crushing revenue and producer gross production revenue are all minimal.

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[1] The constraints implied by the Blair House Accord are not explicitly incorporated in the model, but European Union production of oilseeds increased by only three percent.

To summarize, changes in palm oil tariffs have relatively little influence on the vegetable oil market. This result is dependent on the assumed parameters which indicate, in most cases, that palm oil and vegetable oils are not close substitutes.

Removal of Oilseed Meal Tariffs

Table 11 on page 25 shows the effects of removing oilseed and meal tariffs in Korea (2%) and the ROW (5.6%). Given the limited nature of the tariff changes, the major impact is in the ROW where meal consumption falls by 1.4% and oilseed crush by 6.6%. Crushing revenue in the ROW declines by 15.6% as a result of the removal of protection to the processing industry. Canada and all other countries gain processing revenue. The gain in Canada is 5.2% compared to gains of 5.9% in the United States and 8.5% in the European Union. Oilseed producers in all regions gain with the largest gains occurring in the European Union (1.7%). Gains in other nations are around 0.5%.

Removal of Oilseed Tariffs

Table 12 on page 29 illustrates the effects of removing tariffs on oilseeds. Only two tariffs are included in the model. First, an export tax in Argentina equal to 3.5% works in the opposite direction of an oilseed tariff. An oilseed tax implies effective protection to the processing industry in the absence of tariffs on oil and meal. Second, oilseed tariff is in the ROW (10.7%). A tariff of this size on a raw material input implies significant negative effective protection to oilseed crushers in the ROW. Removing this tariff should increase crushing in the ROW region and decrease it elsewhere. This result is confirmed in Table 12 where ROW oilseed crushing increases by 19.9%. Crushing declines in all other regions with the biggest impact in the Argentine market where crushing declines by 12.1%, at least partially due to the loss of protection to the processing industry from the export tax. Crushing declines in other nations are less severe, ranging from 2.8% in Brazil to 5.8% in Canada.

The Canadian crushing industry loses from a removal of tariffs on seed only with crushing revenue declining by 11.6%. Oilseed producers gain in all regions except the European Union and the ROW. Gains in oilseed producer revenue range from 1.3% in Japan to 6.1% in Argentina.

To summarize, oilseed tariffs are not very prevalent in the developed world. However, oilseed tariffs are more common in the ROW in the AGLINK model. Removing these tariffs eliminates negative effective protection for oilseed crushers in these regions and positive protection for oilseed producers. The effects are obvious. Oilseed crushing increases in the ROW region and oilseed production declines when the tariffs are eliminated. These effects result in losses for Canadian oilseed crushers and gains for Canadian oilseed producers.

Removal of All Tariffs (Zero-for-Zero)

The effects of removing all tariffs simultaneously, the zero-for-zero proposal, are shown in Table 13 on page 33. Given the complex nature of the tariff changes it is difficult to postulate expected effects. The question is essentially an empirical one and the reader who has found the previous four tariff experiments reasonable should have faith in the more complex tariff removal simulation.

Table 13 shows that the removal of all tariffs results in declines in vegetable oil consumption in all regions except China and the ROW. The largest consumption decline is in Argentina (2.0%) and the largest increase is in Japan (2.0%). Vegetable oil consumption in the ROW increases by 1.9% as a result of the tariff removal and by 1.6% in China.

The results for oilseed meal consumption are similar to those for oil except for a change in sign. Consumption of oilseed meal declines in all regions except Brazil, China and the ROW. Most of the changes are small, with the largest change being a 1.5% increase in oilseed meal consumption in the ROW.

The results for oilseed crushing are interesting and varied. The largest decline in oilseed crush takes place in Japan (-24.3%). Declines in oilseed crushing are also evidenced in China (-13.9%) and Argentina (-3.2%). Oilseed crushing activity increases in all other regions with the largest increase (7.2%) occurring in Canada.

Changes in oilseed production tend to be small and production declines only in the ROW (-3.0%). Production increases are the largest in Canada (1.8%) and Brazil (1.3%).

Oilseed oil prices increase in all regions except Japan, China and the Rest of World where the vegetable oil price declines by approximately 10% as a result of tariff removals. Prices in other regions, including Canada, increase by about 6%. Oilseed meal prices increase by about 1.5% in all regions except the ROW where they decline by 3.8%. Similarly, oilseed prices increase in all regions except the ROW. The largest oilseed price increase is in Argentina (6.0%) and Canada's increase is 3.1%. Oilseed prices decline in the ROW by 7.8%.

Oilseed crushing revenue increases by 28.1% in the European Union and 15.2% in Canada which are the largest increases. Crushing revenue in Japan declines by 42.3% and by nearly 30% in China.

Oilseed producers gain in all regions, except the ROW where gross revenue declines by 10.5%. In Canada, gross revenue from oilseed production increases by almost 5% (or $147 million).

It appears that Canada, along with several other developed countries and some less developed countries, have much to gain from the zero-for-zero proposal. Both Canadian crushers and Canadian producers gain from the elimination of tariffs. These gains are offset to some extent by higher consumer prices for oilseed oils that average less than 2%. Livestock producers are essentially unaffected by the tariff elimination since the price of oilseed meal changes only minimally both in the short and long-run.

Removal of the Japanese Oilseed Oil Tariff

Table 14 on page 37 shows the differences in response to the removal of the Japanese vegetable oil tariff found by Meilke and Jay (1997) and in the current study. In order to avoid differences that may be caused by the use of different baselines, only the percentage changes in the key endogenous variables are presented. In both cases, these are the changes six years after the tariffs are removed.

The estimated effect of the tariff removal on the Japanese oilseed oil price is very similar, -15.7% versus -14.8%, in the two studies. However, for all other variables, the estimated effects of the tariff removal are considerably larger in this analysis than in Meilke and Jay. This is especially true for oilseed crush where Japanese crush is estimated to decline by 28.5% in the current study versus a decline of only 6.6% in Meilke and Jay (1997). Similarly, Canadian crushing demand increases more in the current study, 1.74% than the 0.39% predicted by Meilke and Jay (1997). These results most likely flow from the revised crushing demand specifications. Meilke and Jay (1997) found a small negative effect on Canadian oilseed prices (-0.35%) while this study finds a small positive effect (0.30%).

The sensitivity analysis conducted in Chapter 3 on page 39 may shed additional light on the reasons for the different results.

Table 9: Simulation Results for the Removal of Oil Tariff

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Consumption	usaolqc	6,892	KT	-80.5	-1.2	8,184	-145.9	-1.8
CDN Oil Consumption	canolqc	803	KT	-13.2	-1.6	1,017	-24.5	-2.4
EC Oil Consumption	e15olfo	5,837	KT	-147.1	-2.5	6,667	-229.1	-3.4
JPN Oil Consumption	jpnolqc	1,540	KT	58.2	3.8	1,562	28.2	1.8
ARG Oil Consumption	argolqc	503	KT	-7.3	-1.5	781	-17.5	-2.2
BRA Oil Consumption	braolqc	2,150	KT	-27.0	-1.3	2,515	-47.9	-1.9
CHI Oil Consumption	cholqc	5,035	KT	86.0	1.7	5,677	82.4	1.5
ROW Oil Consumption	rwolqc	9,512	KT	260.3	2.7	12,530	308.5	2.5
WLD Oil Consumption	wldolqc	38,367	KT	86.2	0.2	46,132	-152.4	-0.3
U.S. Meal Consumption	usaomqc	25,567	KT	17.7	0.1	30,540	32.5	0.1
CDN Meal Consumption	canomqc	2,218	KT	3.1	0.1	2,756	7.2	0.3
EC Meal Consumption	e15omqc	32,268	KT	32.0	0.1	30,879	34.5	0.1
JPN Meal Consumption	jpnomqc	4,920	KT	3.2	0.1	4,937	8.5	0.2
ARG Meal Consumption	argomqc	654	KT	1.7	0.3	749	3.1	0.4
BRA Meal Consumption	braomqc	5,102	KT	5.7	0.1	5,368	12.7	0.2
CHI Meal Consumption	chomqc	8,494	KT	16.2	0.2	12,322	112.3	0.9
ROW Meal Consumption	rwomqc	25,979	KT	36.3	0.1	35,066	85.0	0.2
WLD Meal Consumption	wldomqc	114,306	KT	123.9	0.1	133,634	311.6	0.2

Table 9: Simulation Results for the Removal of Oil Tariff

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oilseed Crush	usaoscr	36,114	KT	1,307.1	3.6	39,835	2632.0	6.6
CDN Oilseed Crush	canoscr	4,126	KT	190.7	4.6	4,600	516.3	11.2
EC Oilseed Crush	e15oscr	28,495	KT	1,849.8	6.5	30,268	1749.9	5.8
JPN Oilseed Crush	jpnoscr	5,663	KT	-939.1	-16.6	5,851	-1192.4	-20.4
ARG Oilseed Crush	argoscr	15,049	KT	466.9	3.1	17,665	1333.2	7.5
BRA Oilseed Crush	braoscr	22,305	KT	446.9	2.0	26,625	961.3	3.6
CHI Oilseed Crush	choscr	13,015	KT	-1,018.1	-7.8	14,991	-1729.7	-11.5
ROW Oilseed Crush	rwoscr	23,494	KT	-2,409.4	-10.3	33,775	-4170.5	-12.3
WLD Oilseed Crush	wldoscr	160,666	KT	-112.3	-0.1	187,961	117.6	0.1
U.S. Seed Production	usaosqp	67,119	KT	-3.1	0.0	66,916	9.8	0.0
CDN Seed Production	canosqp	7,256	KT	0.0	0.0	9,002	89.2	1.0
EC Seed Production	e15osqp	13,094	KT	0.0	0.0	13,090	3.0	0.0
JPN Seed Production	jpnosqp	120	KT	0.0	0.0	187	0.0	0.0
ARG Seed Production	argosqp	18,533	KT	0.0	0.0	21,683	4.9	0.0
BRA Seed Production	braosqp	25,920	KT	0.0	0.0	31,071	17.0	0.1
CHI Seed Production	chosqp	24,775	KT	0.0	0.0	28,263	6.2	0.0
ROW Seed Production	rwosqp	22,779	KT	0.0	0.0	32,789	6.2	0.0
WLD Seed Production	wldosqp	191,586	KT	-3.1	0.0	216,440	136.4	0.1

Table 9: Simulation Results for the Removal of Oil Tariff

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Price	usaolpp	480	US$/MT	15.0	3.1	511	30.1	5.9
CDN Oil Price	canolpp	701	CDN$/MT	26.2	3.7	715	51.8	7.3
EC Oil Price	e15olpp	418	ECU/MT	15.4	3.7	408	29.7	7.3
JPN Oil Price	jpnolpp	75	'000Y/MT	-13.9	-18.5	69	-6.5	-9.4
ARG Oil Price	argolpp	474	US$/MT	21.5	4.5	504	37.0	7.3
CHI Oil Price	cholpp	604	US$/MT	-77.2	-12.8	611	-59.0	-9.7
ROW Oil Price	rwolpp	597	US$/MT	-70.6	-11.8	605	-52.3	-8.7
WLD Oil Price	e15olwp	508	US$/MT	19.2	3.8	514	38.6	7.5
WLD Palm Oil Price	malplxp	470	US$/MT	-17.2	-3.7	470	0.4	0.1
ROW Palm Oil Price	rwplxp	538	US$/MT	-19.7	-3.7	538	0.4	0.1
CHI Palm Oil Price	chplxp	513	US$/MT	-18.8	-3.7	512	0.4	0.1
CDN Palm Oil Price	canplpp	695	CDN$MT	-25.5	-3.7	672	0.5	0.1
U.S. Meal Price	usaompp	264	US$/MT	-1.4	-0.5	250	-1.2	-0.5
CDN Meal Price	canompp	336	CDN$/MT	-2.0	-0.6	313	-1.7	-0.5
EC Meal Price	e15ompp	198	ECU/MT	-1.1	-0.6	181	-0.9	-0.5
JPN Meal Price	jpnompp	27	'000Y/MT	-0.1	-0.3	28	-0.2	-0.6
ROW Meal Price	rwompp	270	US$/MT	-1.6	-0.6	254	-1.3	-0.5
WLD Meal Price	e15omwp	255	US$/MT	-1.5	-0.6	241	-1.3	-0.5

Table 9: Simulation Results for the Removal of Oil Tariff

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Seed Price	usaospp	252	US$/MT	-1.7	-0.7	237	0.6	0.2
CDN Seed Price	canospp	351	CDN$/MT	-0.8	-0.2	332	4.6	1.4
EC Seed Price	e15osmp	247	ECU/MT	-0.9	-0.4	224	1.5	0.7
JPN Seed Price	jpnospp	34	'000Y/MT	-0.1	-0.3	33	0.0	0.1
ARG Seed Price	argospp	243	US$/MT	-1.6	-0.7	229	0.5	0.2
ROW Seed Price	rwospp	341	US$/MT	-2.2	-0.6	318	0.6	0.2
WLD Seed Price	e15oswp	308	US$/MT	-2.0	-0.6	287	0.5	0.2
U.S. Crushing Revenue	usamar	100	INDEX	11.3	11.3	112	16.5	14.7
CDN Crushing Revenue	canmar	321	mil. $	46.2	14.4	356	86.3	24.3
EC Crushing Revenue	e15mar	100	INDEX	49.9	49.9	155	66.7	42.9
JPN Crushing Revenue	jpnmar	100	INDEX	-48.6	-48.6	103	-37.1	-36.0
ARG Crushing Revenue	argmar	100	INDEX	14.8	14.8	122	25.1	20.5
BRA Crushing Revenue	bramar	100	INDEX	9.7	9.7	122	14.1	11.5
CHI Crushing Revenue	chmar	100	INDEX	-28.2	-28.2	124	-31.1	-25.0
ROW Crushing Revenue	rwmar	100	INDEX	-36.5	-36.5	174	-48.9	-28.1
USA Gross Production Revenue	usagr	100	INDEX	-0.7	-0.7	94	0.2	0.3
CDN Gross Production Revenue	cangr	2,525	mil. $	-5.7	-0.2	2,956	70.6	2.4
EC Gross Production Revenue	e15gr	100	INDEX	3.4	3.4	101	5.6	5.6
JPN Gross Production Revenue	jpngr	100	INDEX	-0.3	-0.3	152	0.2	0.1
ARG Gross Production Revenue	arggr	100	INDEX	-0.7	-0.7	110	0.3	0.3
BRA Gross Production Revenue	bragr	100	INDEX	-0.7	-0.7	113	0.3	0.3
CHI Gross Production Revenue	chgr	100	INDEX	-0.6	-0.6	106	0.2	0.2
ROW Gross Production Revenue	rwgr	100	INDEX	-0.6	-0.6	134	0.3	0.2

Table 10: Simulation Results for the Removal of Palm Oil Tariff

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Consumption	usaolqc	6,892	KT	30.9	0.4	8,184	37.7	0.5
CDN Oil Consumption	canolqc	803	KT	1.0	0.1	1,017	3.2	0.3
EC Oil Consumption	e15olfo	5,837	KT	57.4	1.0	6,667	65.9	1.0
JPN Oil Consumption	jpnolqc	1,540	KT	-0.5	0.0	1,562	-1.1	-0.1
ARG Oil Consumption	argolqc	503	KT	-0.7	-0.1	781	-0.9	-0.1
BRA Oil Consumption	braolqc	2,150	KT	-1.3	-0.1	2,515	-1.1	0.0
CHI Oil Consumption	cholqc	5,035	KT	1.6	0.0	5,677	2.1	0.0
ROW Oil Consumption	rwolqc	9,512	KT	-58.9	-0.6	12,530	-76.7	-0.6
WLD Oil Consumption	wldolqc	38,367	KT	27.1	0.1	46,132	26.1	0.1
U.S. Meal Consumption	usaomqc	25,567	KT	1.4	0.0	30,540	5.6	0.0
CDN Meal Consumption	canomqc	2,218	KT	0.2	0.0	2,756	1.4	0.1
EC Meal Consumption	e15omqc	32,268	KT	2.7	0.0	30,879	5.7	0.0
JPN Meal Consumption	jpnomqc	4,920	KT	0.3	0.0	4,937	1.4	0.0
ARG Meal Consumption	argomqc	654	KT	0.1	0.0	749	0.7	0.1
BRA Meal Consumption	braomqc	5,102	KT	0.5	0.0	5,368	1.5	0.0
CHI Meal Consumption	chomqc	8,494	KT	1.6	0.0	12,322	22.1	0.2
ROW Meal Consumption	rwomqc	25,979	KT	3.2	0.0	35,066	14.6	0.0
WLD Meal Consumption	wldomqc	114,306	KT	10.7	0.0	133,634	55.9	0.0

Table 10: Simulation Results for the Removal of Palm Oil Tariff

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oilseed Crush	usaoscr	36,114	KT	-48.8	-0.1	39,835	-48.8	-0.1
CDN Oilseed Crush	canoscr	4,126	KT	3.4	0.1	4,600	8.6	0.2
EC Oilseed Crush	e15oscr	28,495	KT	55.8	0.2	30,268	41.7	0.1
JPN Oilseed Crush	jpnoscr	5,663	KT	1.4	0.0	5,851	10.9	0.2
ARG Oilseed Crush	argoscr	15,049	KT	1.1	0.0	17,665	10.8	0.1
BRA Oilseed Crush	braoscr	22,305	KT	-18.8	-0.1	26,625	-20.8	-0.1
CHI Oilseed Crush	choscr	13,015	KT	11.0	0.1	14,991	27.1	0.2
ROW Oilseed Crush	rwoscr	23,494	KT	20.2	0.1	33,775	59.4	0.2
WLD Oilseed Crush	wldoscr	160,666	KT	27.3	0.0	187,961	91.9	0.0
U.S. Seed Production	usaosqp	67,119	KT	0.8	0.0	66,916	23.0	0.0
CDN Seed Production	canosqp	7,256	KT	0.0	0.0	9,002	13.0	0.1
EC Seed Production	e15osqp	13,094	KT	0.0	0.0	13,090	0.8	0.0
JPN Seed Production	jpnosqp	120	KT	0.0	0.0	187	0.0	0.0
ARG Seed Production	argosqp	18,533	KT	0.0	0.0	21,683	5.2	0.0
BRA Seed Production	braosqp	25,920	KT	0.0	0.0	31,071	24.8	0.1
CHI Seed Production	chosqp	24,775	KT	0.0	0.0	28,263	10.9	0.0
ROW Seed Production	rwosqp	22,779	KT	0.0	0.0	32,789	14.6	0.0
WLD Seed Production	wldosqp	191,586	KT	0.8	0.0	216,440	92.8	0.0

Table 10: Simulation Results for the Removal of Palm Oil Tariff

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Price	usaolpp	480	US$/MT	2.0	0.4	511	1.8	0.4
CDN Oil Price	canolpp	701	CDN$/MT	3.6	0.5	715	3.1	0.4
EC Oil Price	e15olpp	418	ECU/MT	2.1	0.5	408	1.8	0.4
JPN Oil Price	jpnolpp	75	'000Y/MT	0.1	0.2	69	0.3	0.4
ARG Oil Price	argolpp	474	US$/MT	2.0	0.4	504	1.8	0.4
CHI Oil Price	cholpp	604	US$/MT	3.1	0.5	611	2.8	0.5
ROW Oil Price	rwolpp	597	US$/MT	3.1	0.5	605	2.8	0.5
WLD Oil Price	e15olwp	508	US$/MT	2.6	0.5	514	2.3	0.5
WLD Palm Oil Price	malplxp	470	US$/MT	54.8	11.6	470	54.1	11.5
ROW Palm Oil Price	rwplxp	538	US$/MT	-12.9	-2.4	538	-13.6	-2.5
CHI Palm Oil Price	chplxp	513	US$/MT	12.4	2.4	512	11.8	2.3
CDN Palm Oil Price	canplpp	695	CDN$MT	21.3	3.1	672	32.3	4.8
U.S. Meal Price	usaompp	264	US$/MT	-0.1	0.0	250	-0.2	-0.1
CDN Meal Price	canompp	336	CDN$/MT	-0.2	-0.1	313	-0.3	-0.1
EC Meal Price	e15ompp	198	ECU/MT	-0.1	0.0	181	-0.2	-0.1
JPN Meal Price	jpnompp	27	'000Y/MT	0.0	0.0	28	0.0	-0.1
ROW Meal Price	rwompp	270	US$/MT	-0.1	0.0	254	-0.2	-0.1
WLD Meal Price	e15omwp	255	US$/MT	-0.1	0.0	241	-0.2	-0.1

Table 10: Simulation Results for the Removal of Palm Oil Tariff

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Seed Price	usaospp	252	US$/MT	0.4	0.2	237	0.3	0.1
CDN Seed Price	canospp	351	CDN$/MT	0.9	0.3	332	0.7	0.2
EC Seed Price	e15osmp	247	ECU/MT	0.4	0.2	224	0.3	0.1
JPN Seed Price	jpnospp	34	'000Y/MT	0.0	0.1	33	0.0	0.1
ARG Seed Price	argospp	243	US$/MT	0.4	0.2	229	0.3	0.1
ROW Seed Price	rwospp	341	US$/MT	0.5	0.2	318	0.3	0.1
WLD Seed Price	e15oswp	308	US$/MT	0.5	0.2	287	0.3	0.1
U.S. Crushing Revenue	usamar	100	INDEX	11.3	-0.4	112	16.5	-0.2
CDN Crushing Revenue	canmar	321	mil. $	0.8	0.2	356	1.3	0.4
EC Crushing Revenue	e15mar	100	INDEX	49.9	1.3	155	66.7	0.9
JPN Crushing Revenue	jpnmar	100	INDEX	-48.6	0.1	103	-37.1	0.4
ARG Crushing Revenue	argmar	100	INDEX	14.8	0.0	122	25.1	0.2
BRA Crushing Revenue	bramar	100	INDEX	9.7	-0.4	122	14.1	-0.2
CHI Crushing Revenue	chmar	100	INDEX	-28.2	0.3	124	-31.1	0.4
ROW Crushing Revenue	rwmar	100	INDEX	-36.5	0.4	174	-48.9	0.4
USA Gross Production Revenue	usagr	100	INDEX	-0.7	0.2	94	0.2	0.1
CDN Gross Production Revenue	cangr	2,525	mil. $	6.4	0.3	2,956	10.1	0.3
EC Gross Production Revenue	e15gr	100	INDEX	3.4	0.2	101	5.6	0.2
JPN Gross Production Revenue	jpngr	100	INDEX	-0.3	0.1	152	0.2	0.1
ARG Gross Production Revenue	arggr	100	INDEX	-0.7	0.2	110	0.3	0.1
BRA Gross Production Revenue	bragr	100	INDEX	-0.7	0.2	113	0.3	0.2
CHI Gross Production Revenue	chgr	100	INDEX	-0.6	0.2	106	0.2	0.1
ROW Gross Production Revenue	rwgr	100	INDEX	-0.6	0.2	134	0.3	0.1

Table 11: Simulation Results for the Removal of Oilseed Meal Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Consumption	usaolqc	6,892	KT	1.0	0.0	8,184	-2.6	0.0
CDN Oil Consumption	canolqc	803	KT	0.1	0.0	1,017	-0.4	0.0
EC Oil Consumption	e15olfo	5,837	KT	1.2	0.0	6,667	-3.1	0.0
JPN Oil Consumption	jpnolqc	1,540	KT	0.1	0.0	1,562	-0.5	0.0
ARG Oil Consumption	argolqc	503	KT	0.1	0.0	781	-0.3	0.0
BRA Oil Consumption	braolqc	2,150	KT	0.3	0.0	2,515	-0.9	0.0
CHI Oil Consumption	cholqc	5,035	KT	0.5	0.0	5,677	-1.4	0.0
ROW Oil Consumption	rwolqc	9,512	KT	0.5	0.0	12,530	-1.4	0.0
WLD Oil Consumption	wldolqc	38,367	KT	4.5	0.0	46,132	-11.9	0.0
U.S. Meal Consumption	usaomqc	25,567	KT	-40.1	-0.2	30,540	-78.0	-0.3
CDN Meal Consumption	canomqc	2,218	KT	-7.1	-0.3	2,756	-9.6	-0.3
EC Meal Consumption	e15omqc	32,268	KT	-66.8	-0.2	30,879	-96.8	-0.3
JPN Meal Consumption	jpnomqc	4,920	KT	-7.2	-0.1	4,937	-16.9	-0.3
ARG Meal Consumption	argomqc	654	KT	-3.7	-0.6	749	-4.0	-0.5
BRA Meal Consumption	braomqc	5,102	KT	-7.2	-0.1	5,368	22.5	0.4
CHI Meal Consumption	chomqc	8,494	KT	-40.5	-0.5	12,322	-7.8	-0.1
ROW Meal Consumption	rwomqc	25,979	KT	285.0	1.1	35,066	489.6	1.4
WLD Meal Consumption	wldomqc	114,306	KT	94.3	0.1	133,634	266.5	0.2

Table 11: Simulation Results for the Removal of Oilseed Meal Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oilseed Crush	usaoscr	36,114	KT	502.8	1.4	39,835	1,064.4	2.7
CDN Oilseed Crush	canoscr	4,126	KT	40.4	1.0	4,600	115.0	2.5
EC Oilseed Crush	e15oscr	28,495	KT	410.9	1.4	30,268	391.0	1.3
JPN Oilseed Crush	jpnoscr	5,663	KT	12.1	0.2	5,851	81.6	1.4
ARG Oilseed Crush	argoscr	15,049	KT	80.3	0.5	17,665	245.6	1.4
BRA Oilseed Crush	braoscr	22,305	KT	177.8	0.8	26,625	405.9	1.5
CHI Oilseed Crush	choscr	13,015	KT	53.3	0.4	14,991	162.6	1.1
ROW Oilseed Crush	rwoscr	23,494	KT	-1,222.7	-5.2	33,775	-2,233.6	-6.6
WLD Oilseed Crush	wldoscr	160,666	KT	59.9	0.0	187,961	243.6	0.1
U.S. Seed Production	usaosqp	67,119	KT	1.7	0.0	66,916	58.6	0.1
CDN Seed Production	canosqp	7,256	KT	0.0	0.0	9,002	4.6	0.1
EC Seed Production	e15osqp	13,094	KT	0.0	0.0	13,090	1.6	0.0
JPN Seed Production	jpnosqp	120	KT	0.0	0.0	187	0.0	0.0
ARG Seed Production	argosqp	18,533	KT	0.0	0.0	21,683	16.7	0.1
BRA Seed Production	braosqp	25,920	KT	0.0	0.0	31,071	75.1	0.2
CHI Seed Production	chosqp	24,775	KT	0.0	0.0	28,263	34.9	0.1
ROW Seed Production	rwosqp	22,779	KT	0.0	0.0	32,789	45.4	0.1
WLD Seed Production	wldosqp	191,586	KT	1.7	0.0	216,440	238.2	0.1

Table 11: Simulation Results for the Removal of Oilseed Meal Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Price	usaolpp	480	US$/MT	-0.3	-0.1	511	0.7	0.1
CDN Oil Price	canolpp	701	CDN$/MT	-0.5	-0.1	715	1.2	0.2
EC Oil Price	e15olpp	418	ECU/MT	-0.3	-0.1	408	0.7	0.2
JPN Oil Price	jpnolpp	75	1000Y/MT	0.0	0.0	69	0.1	0.2
ARG Oil Price	argolpp	474	US$/MT	-0.3	-0.1	504	0.7	0.1
CHI Oil Price	cholpp	604	US$/MT	-0.4	-0.1	611	1.0	0.2
ROW Oil Price	rwolpp	597	US$/MT	-0.4	-0.1	605	1.0	0.2
WLD Oil Price	e15olwp	508	US$/MT	-0.4	-0.1	514	0.9	0.2
WLD Palm Oil Price	malplxp	470	US$/MT	-0.3	-0.1	470	0.8	0.2
ROW Palm Oil Price	rwplxp	538	US$/MT	-0.4	-0.1	538	0.9	0.2
CHI Palm Oil Price	chplxp	513	US$/MT	-0.4	-0.1	512	0.9	0.2
CDN Palm Oil Price	canplpp	695	CDN$MT	-0.5	-0.1	672	1.2	0.2
U.S. Meal Price	usaompp	264	US$/MT	3.0	1.1	250	3.5	1.4
CDN Meal Price	canompp	336	CDN$/MT	4.3	1.3	313	5.0	1.6
EC Meal Price	e15ompp	198	ECU/MT	2.4	1.2	181	2.7	1.5
JPN Meal Price	jpnompp	27	1000Y/MT	0.2	0.6	28	0.4	1.5
ROW Meal Price	rwompp	270	US$/MT	-11.2	-4.1	254	-9.8	-3.8
WLD Meal Price	e15omwp	255	US$/MT	3.1	1.2	241	3.7	1.5

Table 11: Simulation Results for the Removal of Oilseed Meal Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Seed Price	usaospp	252	US$/MT	0.9	0.4	237	1.1	0.5
CDN Seed Price	canospp	351	CDN$/MT	0.9	0.3	332	1.0	0.3
EC Seed Price	e15osmp	247	ECU/MT	0.6	0.2	224	0.7	0.3
JPN Seed Price	jpnospp	34	1000Y/MT	0.1	0.2	33	0.1	0.4
ARG Seed Price	argospp	243	US$/MT	0.9	0.4	229	1.0	0.5
ROW Seed Price	rwospp	341	US$/MT	1.2	0.3	318	1.4	0.4
WLD Seed Price	e15oswp	308	US$/MT	1.0	0.3	287	1.2	0.4
U.S. Crushing Revenue	usamar	100	INDEX	11.3	4.2	112	16.5	5.9
CDN Crushing Revenue	canmar	321	mil. $	9.4	2.9	356	18.6	5.2
EC Crushing Revenue	e15mar	100	INDEX	49.9	9.7	155	66.7	8.5
JPN Crushing Revenue	jpnmar	100	INDEX	-48.6	0.8	103	-37.1	3.2
ARG Crushing Revenue	argmar	100	INDEX	14.8	2.4	122	25.1	3.6
BRA Crushing Revenue	bramar	100	INDEX	9.7	3.8	122	14.1	4.9
CHI Crushing Revenue	chmar	100	INDEX	-28.2	1.7	124	-31.1	2.7
ROW Crushing Revenue	rwmar	100	INDEX	-36.5	-20.1	174	-48.9	-15.6
USA Gross Production Revenue	usagr	100	INDEX	-0.7	0.4	94	0.2	0.5
CDN Gross Production Revenue	cangr	2,525	mil. $	6.3	0.3	2,956	10.5	0.4
EC Gross Production Revenue	e15gr	100	INDEX	3.4	1.3	101	5.6	1.7
JPN Gross Production Revenue	jpngr	100	INDEX	-0.3	0.2	152	0.2	0.4
ARG Gross Production Revenue	arggr	100	INDEX	-0.7	0.4	110	0.3	0.5
BRA Gross Production Revenue	bragr	100	INDEX	-0.7	0.4	113	0.3	0.7
CHI Gross Production Revenue	chgr	100	INDEX	-0.6	0.3	106	0.2	0.6
ROW Gross Production Revenue	rwgr	100	INDEX	-0.6	0.3	134	0.3	0.6

Table 12: Simulation Results for the Removal of Oilseed Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Consumption	usaolqc	6,892	KT	2.4	0.0	8,184	18.7	0.2
CDN Oil Consumption	canolqc	803	KT	0.3	0.0	1,017	2.8	0.3
EC Oil Consumption	e15olfo	5,837	KT	2.7	0.0	6,667	21.9	0.3
JPN Oil Consumption	jpnolqc	1,540	KT	0.2	0.0	1,562	2.8	0.2
ARG Oil Consumption	argolqc	503	KT	0.2	0.0	781	2.3	0.3
BRA Oil Consumption	braolqc	2,150	KT	0.8	0.0	2,515	6.1	0.2
CHI Oil Consumption	cholqc	5,035	KT	0.8	0.0	5,677	5.6	0.1
ROW Oil Consumption	rwolqc	9,512	KT	1.1	0.0	12,530	9.8	0.1
WLD Oil Consumption	wldolqc	38,367	KT	10.1	0.0	46,132	85.8	0.2
U.S. Meal Consumption	usaomqc	25,567	KT	4.5	0.0	30,540	-17.9	-0.1
CDN Meal Consumption	canomqc	2,218	KT	0.8	0.0	2,756	1.4	0.0
EC Meal Consumption	e15omqc	32,268	KT	8.4	0.0	30,879	-41.4	-0.1
JPN Meal Consumption	jpnomqc	4,920	KT	0.8	0.0	4,937	-5.2	-0.1
ARG Meal Consumption	argomqc	654	KT	0.4	0.1	749	-0.7	-0.1
BRA Meal Consumption	braomqc	5,102	KT	1.5	0.0	5,368	-14.3	-0.3
CHI Meal Consumption	chomqc	8,494	KT	4.7	0.1	12,322	-63.5	-0.5
ROW Meal Consumption	rwomqc	25,979	KT	9.8	0.0	35,066	-61.6	-0.2
WLD Meal Consumption	wldomqc	114,306	KT	33.0	0.0	133,634	-211.3	-0.2

Table 12: Simulation Results for the Removal of Oilseed Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oilseed Crush	usaoscr	36,114	KT	-825.3	-2.3	39,835	-1,950.6	-4.9
CDN Oilseed Crush	canoscr	4,126	KT	-83.8	-2.0	4,600	-265.6	-5.8
EC Oilseed Crush	e15oscr	28,495	KT	-909.9	-3.2	30,268	-1,016.9	-3.4
JPN Oilseed Crush	jpnoscr	5,663	KT	-30.5	-0.5	5,851	-246.6	-4.2
ARG Oilseed Crush	argoscr	15,049	KT	-931.2	-6.2	17,665	-2,146.6	-12.2
BRA Oilseed Crush	braoscr	22,305	KT	-292.8	-1.3	26,625	-752.9	-2.8
CHI Oilseed Crush	choscr	13,015	KT	-126.3	-1.0	14,991	-455.8	-3.0
ROW Oilseed Crush	rwoscr	23,494	KT	3,317.2	14.1	33,775	6,726.7	19.9
WLD Oilseed Crush	wldoscr	160,666	KT	110.6	0.1	187,961	-127.4	-0.1
U.S. Seed Production	usaosqp	67,119	KT	3.1	0.0	66,916	250.2	0.4
CDN Seed Production	canosqp	7,256	KT	0.0	0.0	9,002	64.4	0.7
EC Seed Production	e15osqp	13,094	KT	0.0	0.0	13,090	5.7	0.0
JPN Seed Production	jpnosqp	120	KT	0.0	0.0	187	0.0	0.0
ARG Seed Production	argosqp	18,533	KT	0.0	0.0	21,683	190.3	0.9
BRA Seed Production	braosqp	25,920	KT	0.0	0.0	31,071	266.0	0.9
CHI Seed Production	chosqp	24,775	KT	0.0	0.0	28,263	118.7	0.4
ROW Seed Production	rwosqp	22,779	KT	0.0	0.0	32,789	-1,043.2	-3.2
WLD Seed Production	wldosqp	191,586	KT	3.1	0.0	216,440	-141.8	-0.1

Table 12: Simulation Results for the Removal of Oilseed Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Price	usaolpp	480	US$/MT	-0.7	-0.1	511	-4.7	-0.9
CDN Oil Price	canolpp	701	CDN$/MT	-1.2	-0.2	715	-8.2	-1.1
EC Oil Price	e15olpp	418	ECU/MT	-0.7	-0.2	408	-4.7	-1.1
JPN Oil Price	jpnolpp	75	'000Y/MT	0.0	-0.1	69	-0.7	-1.0
ARG Oil Price	argolpp	474	US$/MT	-0.7	-0.1	504	-4.7	-0.9
CHI Oil Price	cholpp	604	US$/MT	-1.0	-0.2	611	-7.2	-1.2
ROW Oil Price	rwolpp	597	US$/MT	-1.0	-0.2	605	-7.2	-1.2
WLD Oil Price	e15olwp	508	US$/MT	-0.9	-0.2	514	-6.1	-1.2
WLD Palm Oil Price	malplxp	470	US$/MT	-0.8	-0.2	470	-5.8	-1.2
ROW Palm Oil Price	rwplxp	538	US$/MT	-0.9	-0.2	538	-6.7	-1.2
CHI Palm Oil Price	chplxp	513	US$/MT	-0.9	-0.2	512	-6.3	-1.2
CDN Palm Oil Price	canplpp	695	CDN$MT	-1.2	-0.2	672	-8.3	-1.2
U.S. Meal Price	usaompp	264	US$/MT	-0.4	-0.1	250	1.4	0.6
CDN Meal Price	canompp	336	CDN$/MT	-0.5	-0.2	313	2.0	0.6
EC Meal Price	e15ompp	198	ECU/MT	-0.3	-0.1	181	1.1	0.6
JPN Meal Price	jpnompp	27	'000Y/MT	0.0	-0.1	28	0.2	0.6
ROW Meal Price	rwompp	270	US$/MT	-0.4	-0.2	254	1.6	0.6
WLD Meal Price	e15omwp	255	US$/MT	-0.4	-0.2	241	1.5	0.6

Table 12: Simulation Results for the Removal of Oilseed Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Seed Price	usaospp	252	US$/MT	1.7	0.7	237	3.5	1.5
CDN Seed Price	canospp	351	CDN$/MT	2.7	0.8	332	4.4	1.3
EC Seed Price	e15osmp	247	ECU/MT	1.4	0.6	224	2.5	1.1
JPN Seed Price	jpnospp	34	'000Y/MT	0.1	0.3	33	0.4	1.4
ARG Seed Price	argospp	243	US$/MT	10.6	4.3	229	11.8	5.1
ROW Seed Price	rwospp	341	US$/MT	-31.0	-9.1	318	-26.9	-8.4
WLD Seed Price	e15oswp	308	US$/MT	2.0	0.6	287	3.9	1.4
U.S. Crushing Revenue	usamar	100	INDEX	11.3	-6.7	112	16.5	-10.3
CDN Crushing Revenue	canmar	321	mil. $	-19.0	-5.9	356	-41.1	-11.5
EC Crushing Revenue	e15mar	100	INDEX	49.9	-18.9	155	66.7	-19.6
JPN Crushing Revenue	jpnmar	100	INDEX	-48.6	-2.0	103	-37.1	-9.3
ARG Crushing Revenue	argmar	100	INDEX	14.8	-25.1	122	25.1	-27.9
BRA Crushing Revenue	bramar	100	INDEX	9.7	-6.0	122	14.1	-8.6
CHI Crushing Revenue	chmar	100	INDEX	-28.2	-3.9	124	-31.1	-7.3
ROW Crushing Revenue	rwmar	100	INDEX	-36.5	74.3	174	-48.9	57.9
USA Gross Production Revenue	usagr	100	INDEX	-0.7	0.7	94	0.2	1.8
CDN Gross Production Revenue	cangr	2,525	mil. $	19.1	0.8	2,956	60.8	2.1
EC Gross Production Revenue	e15gr	100	INDEX	3.4	-1.2	101	5.6	-1.8
JPN Gross Production Revenue	jpngr	100	INDEX	-0.3	0.3	152	0.2	1.4
ARG Gross Production Revenue	arggr	100	INDEX	-0.7	4.3	110	0.3	6.1
BRA Gross Production Revenue	bragr	100	INDEX	-0.7	0.7	113	0.3	2.3
CHI Gross Production Revenue	chgr	100	INDEX	-0.6	0.6	106	0.2	1.8
ROW Gross Production Revenue	rwgr	100	INDEX	-0.6	-9.1	134	0.3	-11.4

Table 13: Simulation Results for the Removal of Palm Oil and All Oilseed and Product Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Consumption	usaolqc	6,892	KT	-43.4	-0.6	8,184	-85.2	-1.0
CDN Oil Consumption	canolqc	803	KT	-11.4	-1.4	1,017	-17.9	-1.8
EC Oil Consumption	e15olfo	5,837	KT	-84.1	-1.4	6,667	-138.6	-2.1
JPN Oil Consumption	jpnolqc	1,540	KT	58.1	3.8	1,562	31.1	2.0
ARG Oil Consumption	argolqc	503	KT	-7.4	-1.5	781	-15.4	-2.0
BRA Oil Consumption	braolqc	2,150	KT	-26.2	-1.2	2,515	-41.2	-1.6
CHI Oil Consumption	cholqc	5,035	KT	89.9	1.8	5,677	91.2	1.6
ROW Oil Consumption	rwolqc	9,512	KT	202.5	2.1	12,530	242.4	1.9
WLD Oil Consumption	wldolqc	38,367	KT	136.6	0.4	46,132	-23.9	-0.1
U.S. Meal Consumption	usaomqc	25,567	KT	-16.3	-0.1	30,540	-59.3	-0.2
CDN Meal Consumption	canomqc	2,218	KT	-3.0	-0.1	2,756	-0.1	0.0
EC Meal Consumption	e15omqc	32,268	KT	-23.6	-0.1	30,879	-99.7	-0.3
JPN Meal Consumption	jpnomqc	4,920	KT	-2.9	-0.1	4,937	-12.8	-0.3
ARG Meal Consumption	argomqc	654	KT	-1.4	-0.2	749	-1.2	-0.2
BRA Meal Consumption	braomqc	5,102	KT	0.5	0.0	5,368	21.1	0.4
CHI Meal Consumption	chomqc	8,494	KT	-18.1	-0.2	12,322	55.3	0.4
ROW Meal Consumption	rwomqc	25,979	KT	335.2	1.3	35,066	521.9	1.5
WLD Meal Consumption	wldomqc	114,306	KT	263.0	0.2	133,634	402.7	0.3

Table 13: Simulation Results for the Removal of Palm Oil and All Oilseed and Product Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oilseed Crush	usaoscr	36,114	KT	632.8	1.8	39,835	1,428.7	3.6
CDN Oilseed Crush	canoscr	4,126	KT	118.3	2.9	4,600	329.3	7.2
EC Oilseed Crush	e15oscr	28,495	KT	1,256.6	4.4	30,268	1,203.1	4.0
JPN Oilseed Crush	jpnoscr	5,663	KT	-982.2	-17.3	5,851	-1,420.5	-24.3
ARG Oilseed Crush	argoscr	15,049	KT	-379.3	-2.5	17,665	-557.7	-3.2
BRA Oilseed Crush	braoscr	22,305	KT	211.6	0.9	26,625	515.7	1.9
CHI Oilseed Crush	choscr	13,015	KT	-1,161.0	-8.9	14,991	-2,088.2	-13.9
ROW Oilseed Crush	rwoscr	23,494	KT	443.8	1.9	33,775	919.2	2.7
WLD Oilseed Crush	wldoscr	160,666	KT	130.5	0.1	187,961	337.3	0.2
U.S. Seed Production	usaosqp	67,119	KT	3.7	0.0	66,916	347.6	0.5
CDN Seed Production	canosqp	7,256	KT	0.0	0.0	9,002	161.4	1.8
EC Seed Production	e15osqp	13,094	KT	0.0	0.0	13,090	11.0	0.1
JPN Seed Production	jpnosqp	120	KT	0.0	0.0	187	0.0	0.0
ARG Seed Production	argosqp	18,533	KT	0.0	0.0	21,683	218.2	1.0
BRA Seed Production	braosqp	25,920	KT	0.0	0.0	31,071	387.8	1.2
CHI Seed Production	chosqp	24,775	KT	0.0	0.0	28,263	172.7	0.6
ROW Seed Production	rwosqp	22,779	KT	0.0	0.0	32,789	-976.0	-3.0
WLD Seed Production	wldosqp	191,586	KT	3.7	0.0	216,440	331.0	0.2

Table 13: Simulation Results for the Removal of Palm Oil and All Oilseed and Product Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Oil Price	usaolpp	480	US$/MT	15.2	3.2	511	25.6	5.0
CDN Oil Price	canolpp	701	CDN$/MT	26.6	3.8	715	44.1	6.2
EC Oil Price	e15olpp	418	ECU/MT	15.6	3.7	408	25.3	6.2
JPN Oil Price	jpnolpp	75	‘000Y/MT	-13.9	-18.5	69	-7.1	-10.3
ARG Oil Price	argolpp	474	US$/MT	21.7	4.6	504	32.5	6.5
CHI Oil Price	cholpp	604	US$/MT	-76.9	-12.7	611	-64.8	-10.6
ROW Oil Price	rwolpp	597	US$/MT	-70.3	-11.8	605	-58.1	-9.6
WLD Oil Price	e15olwp	508	US$/MT	19.5	3.8	514	32.8	6.4
WLD Palm Oil Price	malplxp	470	US$/MT	32.9	7.0	470	46.3	9.8
ROW Palm Oil Price	rwplxp	538	US$/MT	-34.8	-6.5	538	-21.4	-4.0
CHI Palm Oil Price	chplxp	513	US$/MT	-9.4	-1.8	512	4.0	0.8
CDN Palm Oil Price	canplpp	695	CDN$MT	-8.5	-1.2	672	21.8	3.2
U.S. Meal Price	usaompp	264	US$/MT	1.0	0.4	250	3.6	1.4
CDN Meal Price	canompp	336	CDN$/MT	1.5	0.4	313	5.1	1.6
EC Meal Price	e15ompp	198	ECU/MT	0.8	0.4	181	2.8	1.5
JPN Meal Price	jpnompp	27	‘000Y/MT	0.1	0.2	28	0.4	1.5
ROW Meal Price	rwompp	270	US$/MT	-13.2	-4.9	254	-9.7	-3.8
WLD Meal Price	e15omwp	255	US$/MT	1.1	0.4	241	3.8	1.6

Table 13: Simulation Results for the Removal of Palm Oil and All Oilseed and Product Tariffs

Variable	Variable Code	1996 Base Value	Units	1996 Post Tariff Values		2001 Base Value	2001 Post Tariff Values	
				Unit Change	% Change		Unit Change	% Change
U.S. Seed Price	usaospp	252	US$/MT	2.1	0.8	237	5.4	2.3
CDN Seed Price	canospp	351	CDN$/MT	4.6	1.3	332	10.3	3.1
EC Seed Price	e15osmp	247	ECU/MT	2.1	0.9	224	4.9	2.2
JPN Seed Price	jpnospp	34	'000Y/MT	0.1	0.4	33	0.7	2.1
ARG Seed Price	argospp	243	US$/MT	10.9	4.5	229	13.7	6.0
ROW Seed Price	rwospp	341	US$/MT	-30.7	-9.0	318	-24.8	-7.8
WLD Seed Price	e15oswp	308	US$/MT	2.3	0.7	287	6.0	2.1
U.S. Crushing Revenue	usamar	100	INDEX	11.3	5.3	112	16.5	7.9
CDN Crushing Revenue	canmar	321	mil. $	28.2	8.8	356	54.0	15.2
EC Crushing Revenue	e15mar	100	INDEX	49.9	32.0	155	66.7	28.1
JPN Crushing Revenue	jpnmar	100	INDEX	-48.6	-50.2	103	-37.1	-42.3
ARG Crushing Revenue	argmar	100	INDEX	14.8	-10.9	122	25.1	-7.5
BRA Crushing Revenue	bramar	100	INDEX	9.7	4.5	122	14.1	6.1
CHI Crushing Revenue	chmar	100	INDEX	-28.2	-31.6	124	-31.1	-29.8
ROW Crushing Revenue	rwmar	100	INDEX	-36.5	8.2	174	-48.9	6.7
USA Gross Production Revenue	usagr	100	INDEX	-0.7	0.8	94	0.2	2.8
CDN Gross Production Revenue	cangr	2,525	mil. $	32.9	1.3	2,956	147.0	5.0
EC Gross Production Revenue	e15gr	100	INDEX	3.4	3.0	101	5.6	5.2
JPN Gross Production Revenue	jpngr	100	INDEX	-0.3	0.4	152	0.2	2.1
ARG Gross Production Revenue	arggr	100	INDEX	-0.7	4.5	110	0.3	7.1
BRA Gross Production Revenue	bragr	100	INDEX	-0.7	0.8	113	0.3	3.6
CHI Gross Production Revenue	chgr	100	INDEX	-0.6	0.7	106	0.2	2.7
ROW Gross Production Revenue	rwgr	100	INDEX	-0.6	-9.0	134	0.3	-10.5

Table 14: Japanese Oilseed Oil Tariff Removal: A Comparison of Results

	Meilke and Jays	Current Study
	%	
CDN Oil Price	0.37	1.09
CDN Oil Consumption	-0.04	-0.30
CDN Meal Price	0.37	1.59
CDN Meal Consumption	-0.17	0.04
CDN Oilseed Price	-0.35	0.30
CDN Oilseed Crush	0.39	1.74
CDN Oilseed Production	-0.13	0.15
JPN Oil Price	-15.73	-14.80
JPN Oil Consumption	1.71	2.94
JPN Meal Consumption	-0.09	0.04
JPN Oilseed Consumption	-6.60	-28.53
JPN Oilseed Production	0.00	0.00
World Oil Price	0.36	1.13

Chapter 3: Sensitivity Analysis

In Chapter 2 it was shown that Canada benefits from trade liberalization in the oilseed and oilseed products sector. These benefits extend across both oilseed crushers and oilseed producers. However, the results are predicated on two assumptions. First, that all countries in the world agree to eliminate their tariffs and export subsidies on oilseed and oilseed product trade. In reality, some countries, particularly those that are not members of the World Trade Organization (WTO), may not be willing to remove their border protection. Second, the results are contingent upon the assumed baseline parameters. While the authors feel the baseline parameters are reasonable, it is possible that the "true" elasticities governing supply and demand responses are different from the ones used in the base model. In this section, the robustness of the economic analysis conducted in Chapter 2 is tested by conducting sensitivity analysis: First, with respect to the number of countries that participate in the zero-for-zero proposal; and secondly, in terms of the assumed economic parameters.

The Benefits of Trade Liberalization as the Number of Participating Countries Changes

Table 15 on page 43 shows the effects of changing the number of countries who participate in oilseed trade liberalization. The results are reported for only eight variables, but these are the variables of most importance to Canada: 1) Canadian oilseed crush, 2) Canadian seed production, 3) Canadian seed price, 4) world oil price, 5) world meal price, 6) world seed price, 7) Canadian oilseed crushing revenue, above the cost of seed, and 8) Canadian gross oilseed production revenue. The first two columns of Table 15 show the 2001 values for these eight variables under the baseline assumptions i.e., that the tariffs in all countries remain in place. The third and fourth columns of Table 15 show the effects of oilseed trade liberalization when all countries participate in the liberalization exercise i.e., the zero-for-zero proposal.[1] These are the same numbers that were reported in Table 13 on page 33 and illustrate the effects of trade liberalization under the baseline parameter assumptions, and under the assumption that all the countries participate in the liberalization initiative.

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[1] The effects are reported as unit and percentage changes from the baseline simulation.

The fifth and sixth columns in Table 15 show what happens if all countries, except Japan and China, liberalize oilseed and oilseed product trade. Under this scenario, the benefits of trade liberalization are reduced and this is especially so for Canadian oilseed crushers. For Canadian oilseed crushers the revenue gain is $54 million (15.2%) if all countries participate in the trade liberalization, but the benefit is reduced to $20.7 million (5.8%) if Japan and China are excluded. The gains for Canadian oilseed producers are not greatly affected by China and Japan not participating in the trade liberalization. If all countries participate, Canadian oilseed producers' gross revenue increases 5%, whereas if Japan and China do not participate, revenue gains are 4.5%. Most of the gain to Canadian oilseed producers comes from elimination of the tariff on seed in the ROW.

The last two columns of Table 15 show the effects of trade liberalization if the ROW does not participate in the liberalization exercise. Under this scenario, the gains to Canadian oilseed crushers are nearly as large as they are when all countries liberalize. However, gains to Canadian oilseed producers are reduced by nearly 50%, from $147 million if all countries liberalize, to $77.8 million if the ROW does not change its border policies.

While other scenarios could be constructed, with different countries included and excluded from trade liberalization, these results are sufficient to show that who participates is important. In addition, the distribution of Canada's gains from trade liberalization also differ depending on the countries who liberalize their border policies. Nonetheless, based on the three scenarios examined, Canada always gains from oilseed and oilseed product trade liberalization and the gains are larger as more countries participate in the liberalization initiative.

Sensitivity of Trade Liberalization Results to Different Parameter Assumptions

In this section, some of the parameters in the base model are modified to examine the impact that these changes have on the results of trade liberalization. In each case, the comparison is made between the 2001 results using the baseline parameter estimates and the 2001 results using the revised parameter estimates. In both cases, it is assumed all countries remove all border protection. Before proceeding, it is useful to outline the procedure that is used to generate these results:

- Selected parameters in the base model are changed.
- The constants in the equations that have undergone a parameter change are adjusted so that a simulation of the revised model results in the same baseline forecasts, from 1996 to 2001, as obtained using the original model.
- The tariffs are removed and the model with the revised parameter estimates is resimulated.
- The 2001 trade liberalization results from the revised model are compared to the 2001 trade liberalization results from the original model.

The first set of sensitivity analysis is reported in Table 16 on page 44. Columns (3) and (4) of Table 16 show the effects of trade liberalization under the baseline assumptions. Again, these are the same numbers that are reported in Table 13. The figures in columns (5) through (10) show the predicted outcome of trade liberalization under different parameter assumptions.

Three different scenarios are compared in Table 16. In each of these scenarios, the parameters/elasticities in the United States, Canada, the European Union, ROW, China and Japan are doubled from their original values.

Columns (5) and (6) show the effects of doubling the palm oil cross price elasticity in the vegetable oil demand equations, columns (7) and (8) show the effects of doubling the direct price elasticity in the vegetable oil demand equations and, columns (9) and (10) show the effects of doubling the oilseed meal demand elasticities on the predicted values of eight key variables.

In examining the numbers reported in Table 16, it becomes clear that none of the new parameter assumptions has a major impact on the estimated gains from trade liberalization. The largest difference stems from doubling the palm oil cross price elasticity in the vegetable oil demand equations. Doubling the cross price elasticities increases the benefits of trade liberalization to Canada's crushing sector from $54 million to $61.8 million. Similarly, the benefits to Canada's oilseed production sector increase from $147 million to $200 million if the palm oil cross price effect is increased.

Table 17 on page 45 illustrates the sensitivity of the trade liberalization results to different assumptions with respect to the crush demand elasticities. In these scenarios, the crush demand elasticity in the United States, Canada, European Union, ROW, China and Japan are first reduced by 25% from their baseline values (columns (5) and (6)) and then increased by 25% from their baseline values (columns (7) and (8)) in the second experiment. It is clear from the results in Table 17 that the value of the crush demand elasticity is important in determining the benefits from oilseed and oilseed product trade liberalization. Reducing the crush demand elasticity by 25% in the six countries simultaneously, reduces the benefits to the Canadian crushing sector from a gain of $54 million to a gain of $36.1 million. Conversely, increasing the crush demand elasticities by 25% increases the benefits to Canada's crushing sector from $54 million to $139.9 million.

The predicted change in the benefits to Canadian oilseed producers as a result of changing parameter assumptions, in crush demand, is far less dramatic than for oilseed processors but moves in the same direction. Benefits to Canada's oilseed producers are $147 million under the baseline parameter assumptions. The predicted benefits drop to $140 million with a reduced crush demand elasticity and rise to $163.5 million with an increased crush demand elasticity.

The results in Table 18 on page 46 are similar to those in Table 17, except the crush demand elasticity is modified only for Canada, holding the crush demand elasticity in all other regions constant. Again, the gains to Canada's crushing sector are highly dependent on the assumed crush demand elasticity. A 25% reduction in the Canadian crush demand elasticity reduces the estimated benefits of trade liberalization from $54 million to $36.6 million. An increase in the crush demand elasticity by 25% increases the estimated benefits from $54 million, under baseline parameter assumptions, to $122.2 million with a larger crush demand elasticity.[1] A comparison of Tables 17 and 18 illustrates that the key parameter in determining the benefits from trade liberalization to Canada's oilseed crushers and oilseed producers is the assumed crush demand elasticity. Increasing the Canadian crush demand elasticity by 25% results in a gain to oilseed processors that is almost as large (30.4%) as that found when the crush demand elasticities were increased by 25% in all six countries (39.3%).

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[1] The results in Tables 17 and 18 are consistent with the comparative static findings of Meilke and Jay (1997).

The final results of parameter sensitivity analysis are in the last two columns of Table 18. In these columns, the effect of increasing Canada's direct price elasticity for vegetable oils by 100% is examined. Again, similar to the results reported in Table 16, the Canadian oilseed demand elasticity has only a minor effect on the estimated benefits of trade liberalization.

Based on the preceding experiments, it appears the crush demand elasticity is the key parameter in determining the benefits to Canada from oilseed and oilseed product trade liberalization. What economic behaviour is this parameter attempting to capture? Technically, the crush demand elasticity determines how much crushing activity changes, given a change in the gross crushing margin. The larger the crush demand elasticity, the more influence the crushing margin has on crush activity. This applies both to increases in crushing activity, resulting from increases in the margin brought about through trade liberalization in those countries where protection is currently small or non-existent, but also results from declines in crushing activity, in those countries that are eliminating protection, and hence reducing the crushing margin received by their oilseed crushers.

As noted earlier, the crush demand elasticities used in this study are more elastic than those that result from econometric estimation and that are included in many other econometric models. However, this elasticity not only has to capture the effect of short-run variations in the crushing margin on crushing activity, but over a six-year time period it must also reflect decisions of where to locate new crushing facilities. If crushing margins are reduced significantly as a result of losses in protection, new crushing plants are less likely to be located in these regions. New investments in crushing capacity are more likely in regions where protection has previously been small or non-existent. This is the impact that is being picked up in the results reported in all of the trade liberalization experiments. The more mobile crushing plants are across countries, the larger the long-run gains from trade liberalization for Canada.

Summary

To summarize the effects of the sensitivity analysis, two conclusions seem undisputed. First, the number of countries that participate in the zero-for-zero policy is important in determining the benefits of trade liberalization for Canada. The more countries that liberalize, the larger the benefits. Benefits accrue to both Canadian crushers and oilseed producers from a relatively widespread liberalization effort. Second, the magnitude of the benefits to Canada depend crucially on Canada's crush demand elasticity. This parameter determines how sensitive Canadian crushing is to changes in the crushing margin. The larger this price response, the larger the gains to Canada's crushing sector and also to its oilseed producers. The smaller this response, the smaller the gains to Canada's crushers and oilseed producers. However, under any scenario examined as a part of this study, the gains to Canada's oilseed crushers and oilseed producers are always positive. There appears to be little conflict between the goals of these two groups. Both will benefit from further trade liberalization in the oilseed and oilseed product sector.

Table 15: The Benefits of Trade Liberalization as the Number of Participating Countries Change

Variable	2001 Base Value	Units	Countries Who Liberalize Trade: 2001 Changes from Base					
			All Countries		Excluding Japan and China		Excluding ROW	
			Unit Change	% Change	Unit Change	% Change	Unit Change	% Change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CDN Oilseed Crush	4,600	KT	329.3	7.2	126.5	2.8	304.3	6.6
CDN Seed Production	9,002	KT	161.4	1.8	144.2	1.6	99.1	1.1
CDN Seed Price	332	CDN$/MT	10.3	3.1	9.5	2.9	5.0	1.5
WLD Oil Price	514	US$/MT	32.8	6.4	20.9	4.1	30.2	5.9
WLD Meal Price	241	US$/MT	3.8	1.6	4.0	1.6	-2.0	-0.8
WLD Seed Price	287	US$/MT	6.0	2.1	6.3	2.1	1.3	0.5
CDN Crushing Revenue	356	mil $	54.0	15.2	20.7	5.8	49.1	13.8
CDN Gross Production Revenue	2,956	mil $	147.0	5.0	134.3	4.5	77.8	2.6

Table 16: Sensitivity of Trade Liberalization Results to Different Parameter Assumptions: Oil and Meal Demand Elasticities

Variable	2001 Base Value	Units	Base Parameters		Elasticities Doubled from Base Values					
					Palm Oil		Oil Demand		Meal Demand	
			Unit Change	% Change	Unit Change	% Change	Unit Change	% Change	Unit Change	% Change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CDN Oilseed Crush	4,600	KT	329.3	7.2	372.0	8.1	338.2	7.4	329.7	7.2
CDN Seed Production	9,002	KT	161.4	1.8	215.6	2.4	174.8	1.9	161.0	1.8
CDN Seed Price	332	CDN$/MT	10.3	3.1	14.1	4.2	11.0	3.3	10.4	3.1
WLD Oil Price	514	US$/MT	32.8	6.4	46.5	9.1	35.2	6.9	32.4	6.3
WLD Meal Price	241	US$/MT	3.8	1.6	2.6	1.1	3.6	1.5	4.1	1.7
WLD Seed Price	287	US$/MT	6.0	2.1	7.7	2.7	6.3	2.2	6.1	2.1
CDN Crushing Revenue	356	mil $	54.0	15.2	61.8	17.4	55.5	15.6	54.1	15.2
CDN Gross Production Revenue	2,956	mil $	147.0	5.0	200.0	6.8	157.5	5.3	147.5	5.0

Note:Elasticities were doubled in the following regions: Canada, China, EU15, Japan, ROW and United States.

Table 17: The Benefits of Trade Liberalization as the Number of Participating Countries Change

Variable	2001 Base Value	Units	Base Parameters		Elasticities Changed from Base Values			
					Crush Demand 25% Reduction		Crush Demand 25% Increase	
			Unit Change	% Change	Unit Change	% Change	Unit Change	% Change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CDN Oilseed Crush	4,600	KT	329.3	7.2	105.8	2.3	1,362.5	29.6
CDN Seed Production	9,002	KT	161.4	1.8	154.2	1.7	179.6	2.0
CDN Seed Price	332	CDN$/MT	10.3	3.1	9.9	3.0	11.4	3.4
WLD Oil Price	514	US$/MT	32.8	6.4	31.4	6.1	37.5	7.3
WLD Meal Price	241	US$/MT	3.8	1.6	4.2	1.7	2.8	1.2
WLD Seed Price	287	US$/MT	6.0	2.1	5.8	2.0	6.4	2.2
CDN Crushing Revenue	356	mil $	54.0	15.2	36.1	10.1	139.9	39.9
CDN Gross Production Revenue	2,956	mil $	147.0	5.0	140.4	4.8	163.5	5.5

Note:Elasticities were changed in the following regions: Canada, China, EU15, Japan, ROW and United States.

Table 18: Sensitivity of Trade Liberalization Results to Different Parameter Assumptions: Canadian Crush and Oil Demand Elasticities

Variable	2001 Base Value	Units	Base Parameters		CDN Elasticities Changed from Base Values					
					Crush Demand 25% Reduction		Crush Demand 25% Increase		Oil Demand 100% Increase	
			Unit Change	% Change	Unit Change	% Change	Unit Change	% Change	Unit Change	% Change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CDN Oilseed Crush	4,600	KT	329.3	7.2	107.2	2.3	1216.8	26.5	331.7	7.2
CDN Seed Production	9,002	KT	161.4	1.8	164.4	1.8	153.0	1.7	164.6	1.8
CDN Seed Price	332	CDN$/MT	10.3	3.1	10.5	3.2	9.7	3.0	10.5	3.2
WLD Oil Price	514	US$/MT	32.8	6.4	34.1	6.6	27.8	5.4	33.4	6.5
WLD Meal Price	241	US$/MT	3.8	1.6	3.7	1.6	4.2	1.8	3.7	1.6
WLD Seed Price	287	US$/MT	6.0	2.1	6.0	2.1	6.0	2.1	6.1	2.1
CDN Crushing Revenue	356	mil $	54.0	15.2	36.6	10.3	122.2	34.4	54.4	15.3
CDN Gross Production Revenue	2,956	mil $	147.0	5.0	150.0	5.1	138.6	4.7	149.6	5.1

Chapter 4: Domestic Oilseed Policies

The preceding chapters examined the implications of removing border protection for oilseed and oilseed product trade. Throughout the study, it has been implicitly assumed that domestic policies would remain intact. This may not be a correct assumption. Many types of domestic policies, for example, market price supports, cannot be maintained without border protection. However, other types of domestic policies such as deficiency payments to domestic producers could be continued without border protection. A logical extension of the zero-for-zero policy would be a zero-zero-zero policy which would eliminate export subsidies, tariffs and domestic policies on oilseeds and oilseed products. However, in order to undertake quantitative policy analysis of this option, considerable effort would have to be devoted to gathering information on domestic policies, particularly outside the OECD countries.

Domestic policies would seem to be less pervasive in OECD countries for oilseed products than for many other commodities. Table 19 on page 49 shows the producer subsidy equivalents (PSEs) for oilseeds in ten different countries. The PSE estimates include the influence of both border and domestic policies.[1] However, Table 19 shows that for many countries the support and protection provided to oilseed producers has dropped substantially between 1986–1988 and 1996. In Australia, Canada, the Czech Republic, Hungary, Japan and Mexico, the PSE in 1996 is less than one-half of its value in 1986-88.[2] The PSE for oilseeds remains high in the European Union, Japan, Poland and Turkey.

In the past few years, there have been major changes in domestic policies influencing the grain and oilseed sectors in some of the most important producing regions. In the United States, deficiency payments for wheat and coarse grains have been replaced by non-commodity specific area payments. In Canada, the Western Grain Transportation Act has been eliminated and payments from domestic safety net programs have been sharply reduced. Even the European Union, where the oilseed PSE remains high, has agreed to limit oilseed production as a result of the Blair House Accord, signed during the Uruguay Round of multilateral trade negotiations.

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[1] The PSE includes all forms of support, including those forms of support often considered decoupled from production decisions.

[2] Meilke (1991) contains a discussion of the various aggregate measures of support including the PSE. In one other country, the United States, the PSE in 1996 is only 7%.

In examining the current version of the AGLINK model, it appears that domestic policies play a relatively little role in determining oilseed supply response for the countries included in the econometric model. No domestic oilseed policies are included for Australia, Mexico, ROW or the United States. For Canada, the Western Grain Transportation Act subsidy is included in the model, but this program has been eliminated and therefore has no effect on current output decisions. Direct payments for oilseed producers in the European Union are included in the model, as are direct payments to Japanese oilseed producers. As was the case with border protection, domestic policies may be more important in countries that are not explicitly modelled in the AGLINK framework. However, to discover the exact domestic policies, the countries in which they operate, and to include these in the AGLINK modelling framework, is a major data and information gathering exercise.

Some feel for the importance of the non-OECD countries in world oilseed production is captured in Table 20 on page 50 and Figures 1 through 7. World oilseed production equalled 256.6 million metric tons in 1995 (See Table 20). Of the total oilseed production, 145.9 million metric tons (56.8%) were in less developed countries. The annual trend increase in production, on a world basis, was 6.4 million metric tons per year. This amounted to 2.5% of world total production in 1995. There is some production variability around the trend in world oilseed production, but Figure 1 on page 51 shows there has been no significant change in the trend over the period 1970–1996. The same is true for the annual oilseed production that takes place in less developed countries (See Figure 2 on page 51).

In less developed countries, the annual trend increase in oilseed production has been 4.2 million metric tons, or 2.9% of 1995 oilseed production. The trend increase in oilseed production has been smaller in developed countries, at 2.1 million metric tons per year or 2.2% of 1995 production. In addition, the variability around this trend increase in developed countries has been much larger than in less developed countries (See Table 20 and Figure 3). Over the period 1970 to 1996, the trend increase in oilseed production in the European Union has been the most substantial, on a percentage basis, of the countries/regions shown in Table 20. However an examination of Figure 4 on page 52 shows that the trend increase in production has essentially dissipated since 1987, with production stabilizing between 1.1 and 1.4 million metric tons per year. Oilseed production in the United States is the most variable around the trend line of any of the regions examined in Table 20 (See Figure 5 on page 53). While there is a positive trend in oilseed production between 1970 and 1996, the trend appears to have slowed considerably since the early 1980s.

Table 20 and Figures 8 on page 54 and 9 on page 55 show the trend in world palm oil and world tropical oil production. Production variability around the trend line, in the production of both palm and tropical oils, is extremely small. Palm oil accounts for about 75% of tropical oil production and output has been increasing by 0.4 million metric tons per year.

Table 20 and Figures 1 through 9 say little about the affect of domestic policies on oilseed production. However, they do illustrate that the growth rate in oilseed production has been modest in the developed countries, particularly since the 1980s. Conversely, the growth rate in South America and the less developed countries is larger and shows no signs of diminishing. This is even more pronounced for palm and tropical oil production. Consequently, a careful analysis of the effect of domestic policies on world oilseed production and trade would need to look carefully at the less developed countries. This would require identification, description and modelling the effects of their policies on world production.

The removal of all domestic policies in the oilseed and oilseed product sector would lead to worldwide welfare gains. This argument follows from the simple gains from trade principles. However, the benefits of removing domestic policies would accrue primarily to domestic taxpayers, domestic consumers and non-subsidizing oilseed exporters. Removing domestic oilseed policies would result in losses for domestic oilseed producers. Consequently, the political pressure to maintain these policies, in subsidizing nations, may be much greater than is the case for border measures. Canadian oilseed producers might gain from the removal of domestic support and protection worldwide. Currently, payments to Canadian oilseed producers are relatively small. Hence, they would stand to benefit from the increase in world oilseed prices that would follow from the removal of domestic support. The quantitative measurement of the size of these gains requires a major research effort.

Table 19: Producer Subsidy Equivalents for Oilseeds, Selected Countries and Years

	Year		
	1986-88	**1993-95**	**1996e**
	%		
Australia	10	7	5
Canada	31	14	14
Czech Republic	49	3	2
European Union	69	55	56
Hungary	27	-15	11
Japan	78	30	29
Mexico	19	23	9
Poland	-35	24	28
Turkey	42	27	44
United States	10	9	7

Note: The 1986-88 figures for the Czech Republic, Hungary, Mexico and Poland are for the years 1989-91.

Source: OECD, 1997. Agricultural Policies in OECD Countries: Measurement of Support and Background Information. Paris.

e = Estimated.

Table 20: Trends in Oilseed, Palm Oil and Tropical Oil Production, 1970 to 1996, for Selected Regions

Regions/Countries	1995 Production	Annual Trend Increase in Production	Trend Production Increase as a Percent of 1995 Production	R-Squared of Trend Line
	mmt	mmt	%	
All Oilseeds:				
World	256.6	6.4	2.5	0.97
Developed Countries	93.9	2.1	2.2	0.83
Less Developed Countries	145.9	4.2	2.9	0.98
South America	48.6	1.7	3.5	0.98
Canada	8.8	0.2	2.3	0.80
European Union	13.2	0.6	4.5	0.87
United States	69.1	1.2	1.7	0.60
All Tropical Oils:				
World	21.0	0.4	1.9	0.99
Palm Oil:				
World	15.8	0.4	2.5	0.99

Source: U.S. Department of Agriculture. 1997. P, S and D View.
Note: Trends are calculated over the period 1970 to 1996.

Figure 1: World Oilseed Production

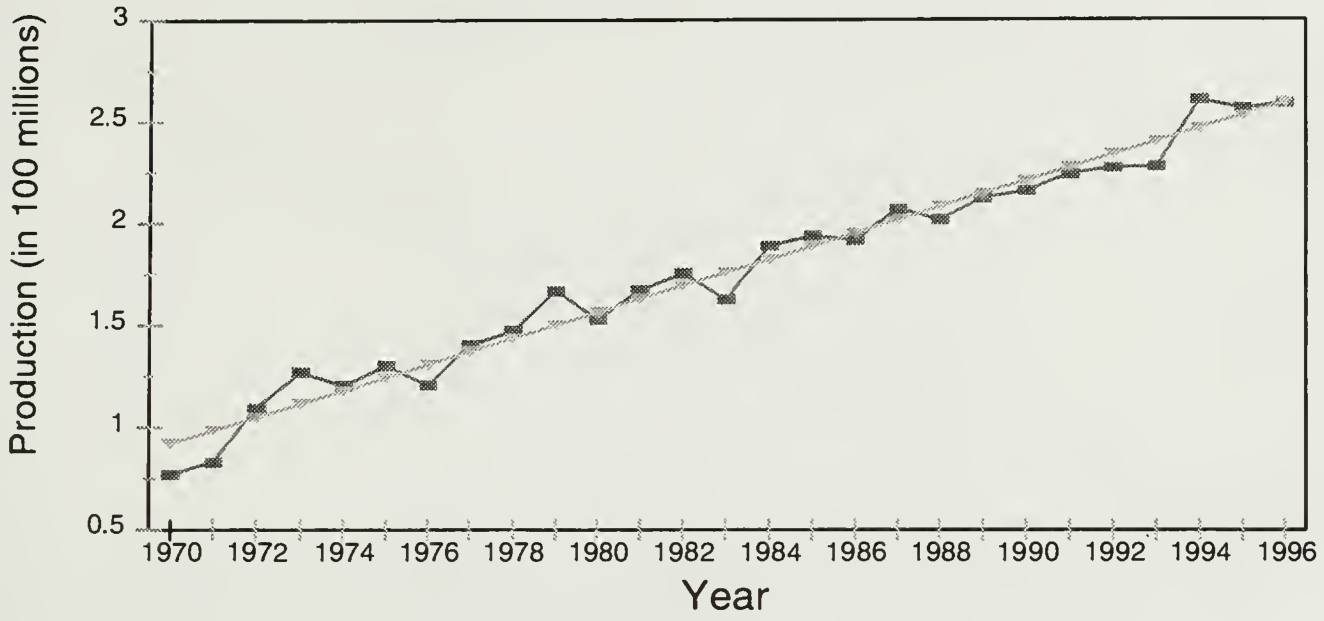


Figure 2: Developed Countries Oilseed Production

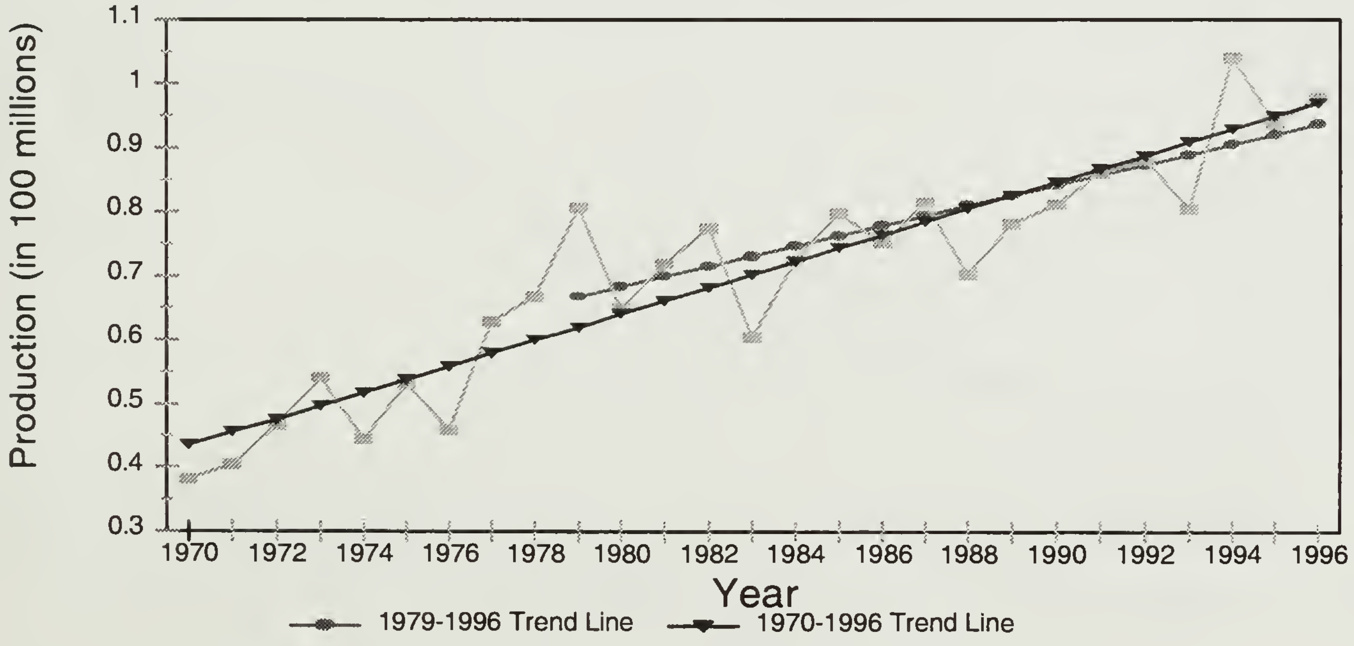


Figure 3: Less Developed Oilseed Production

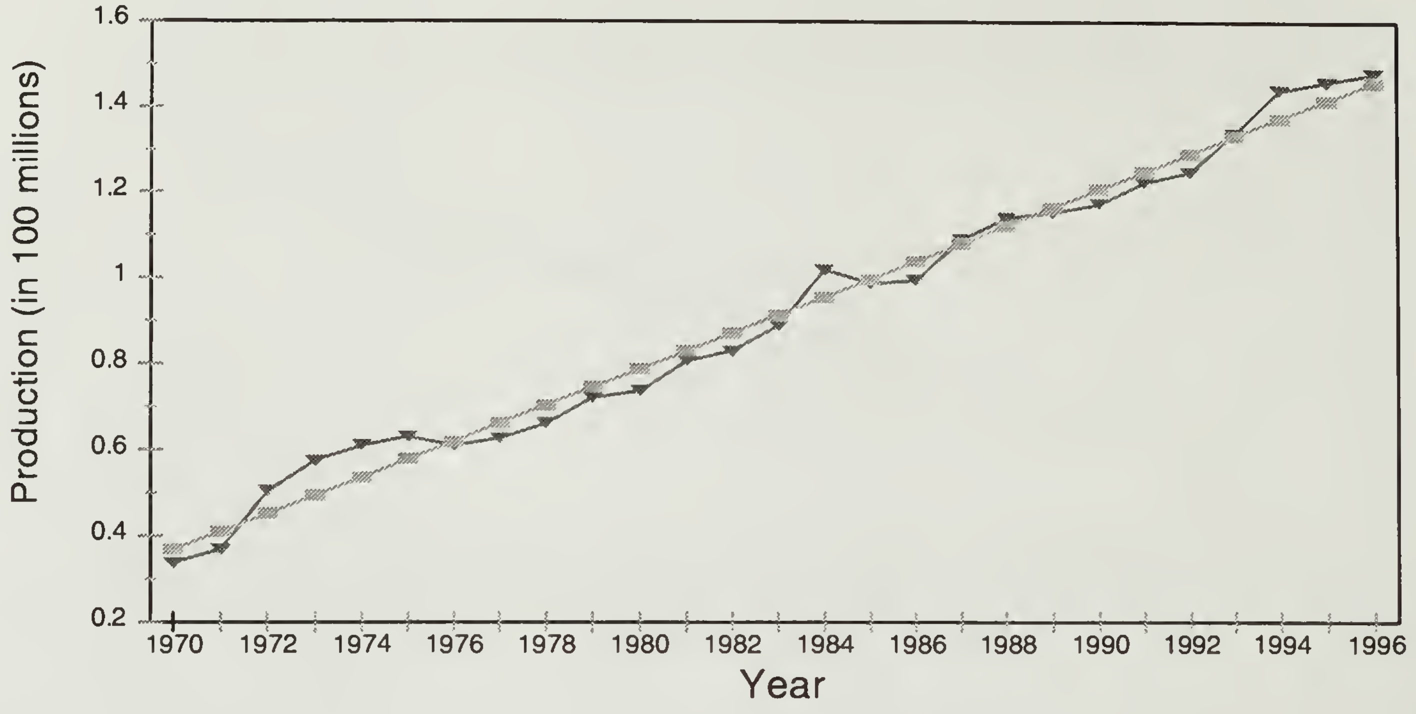


Figure 4: European Union Oilseed Production

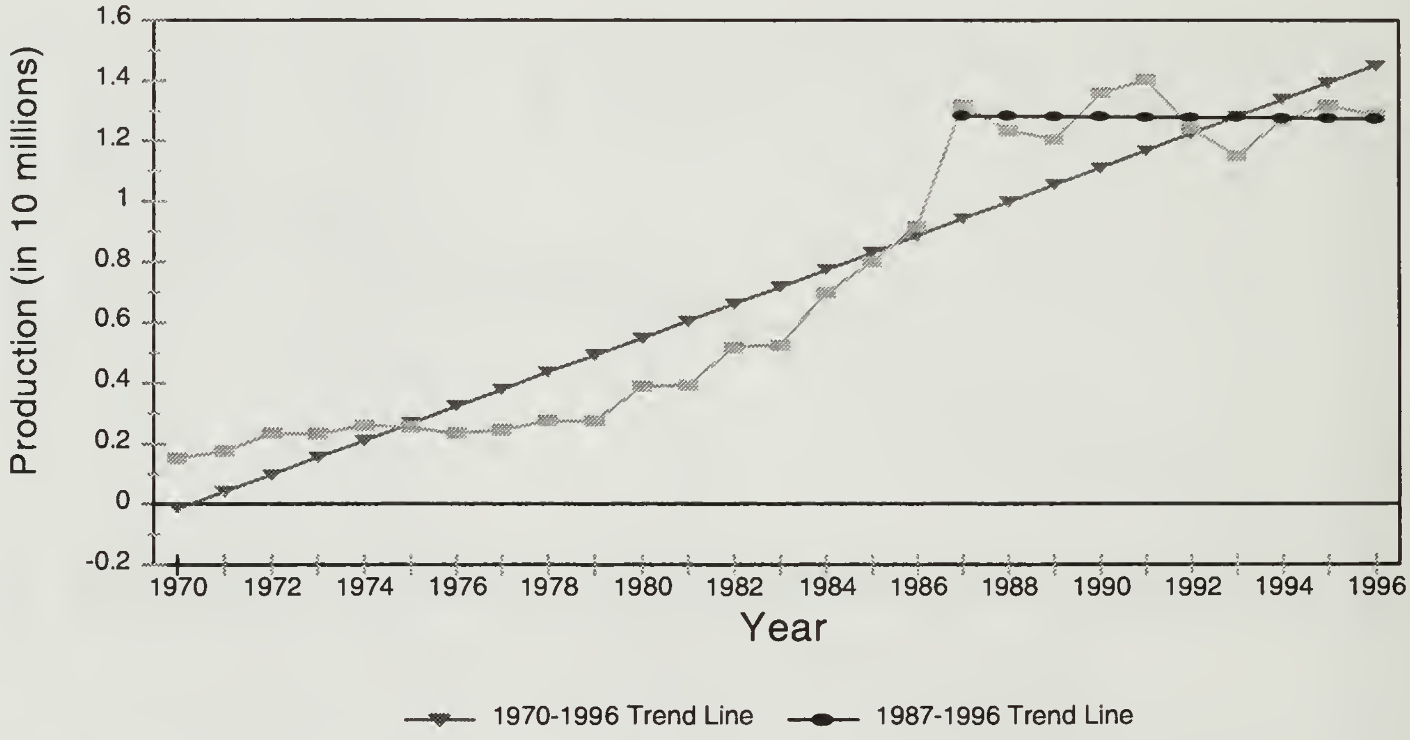


Figure 5: United States Oilseed Production

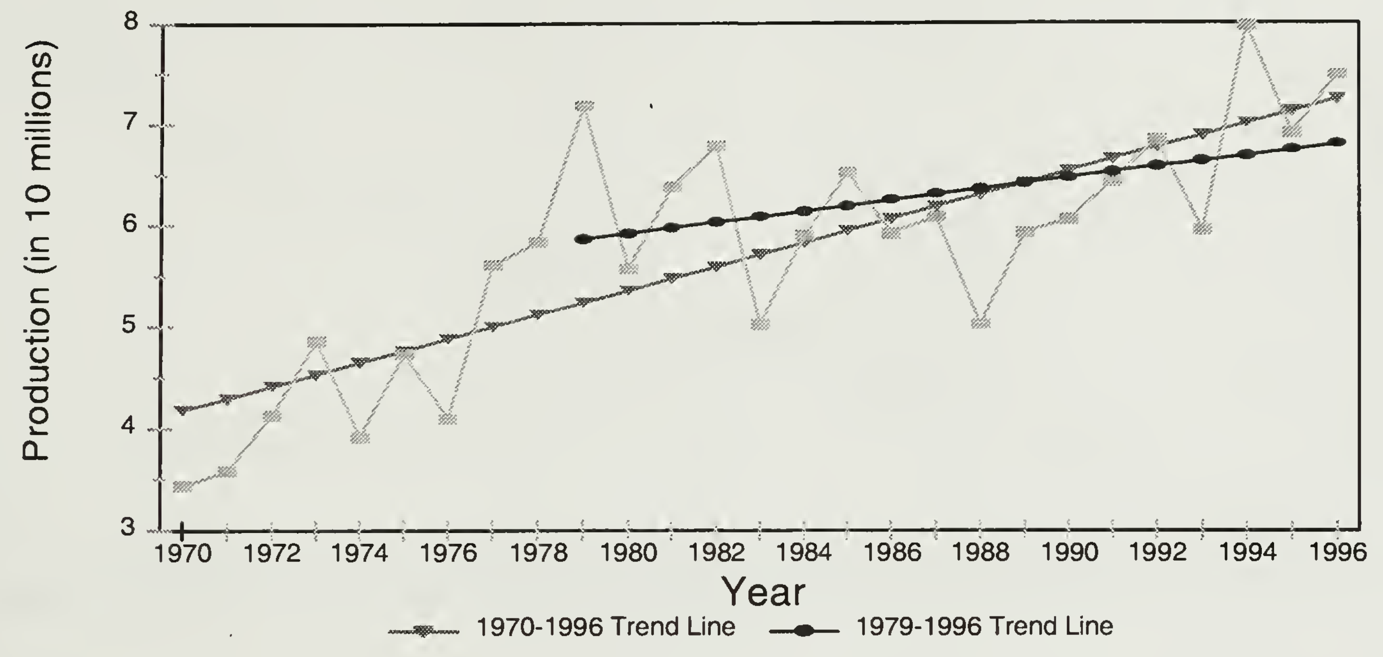


Figure 6: Canada Oilseed Production

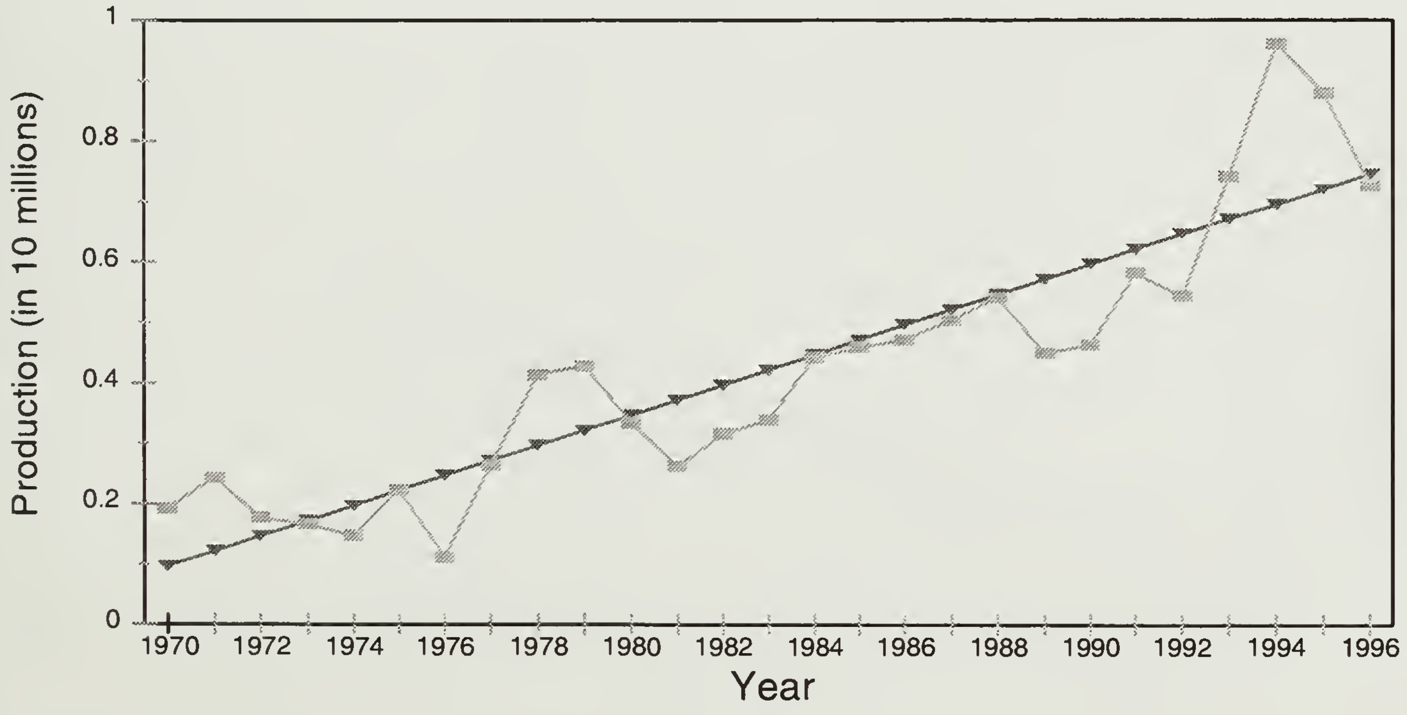


Figure 7: South America Oilseed Production

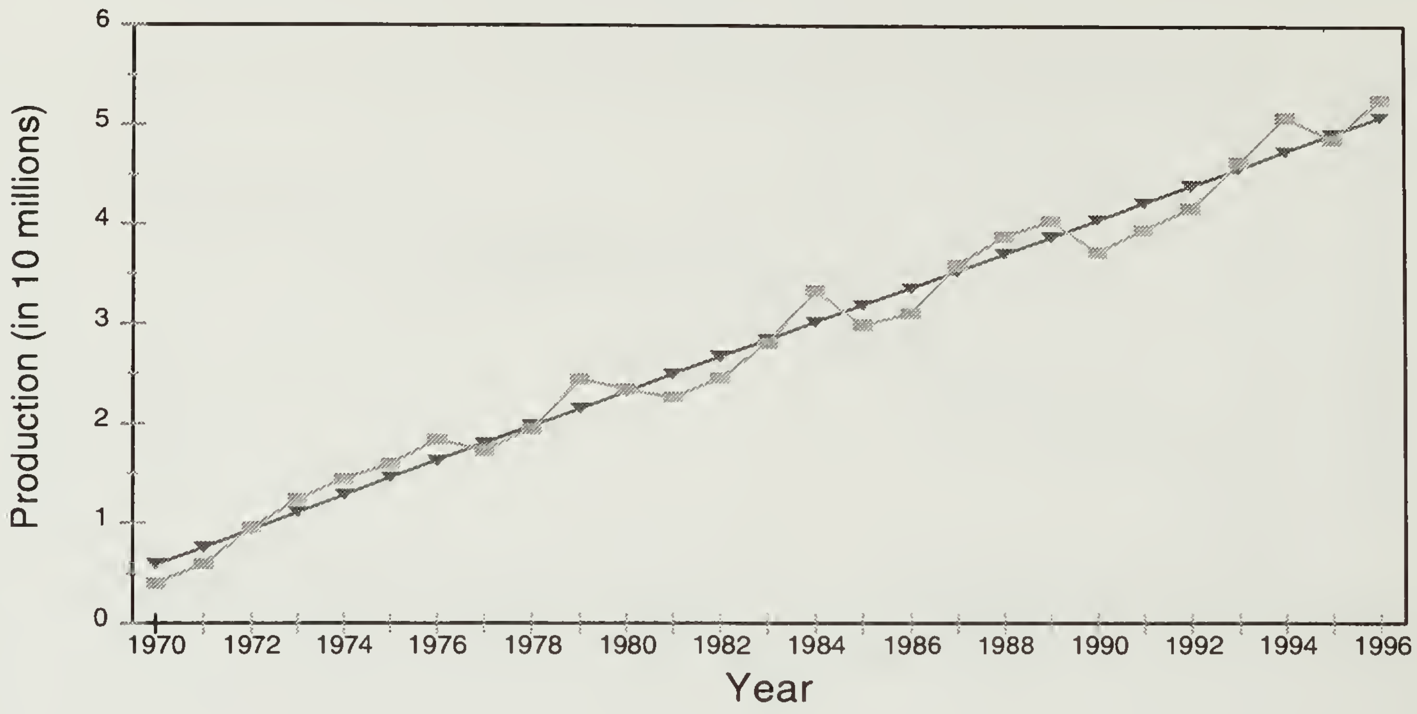


Figure 8: World Palm Oil Production

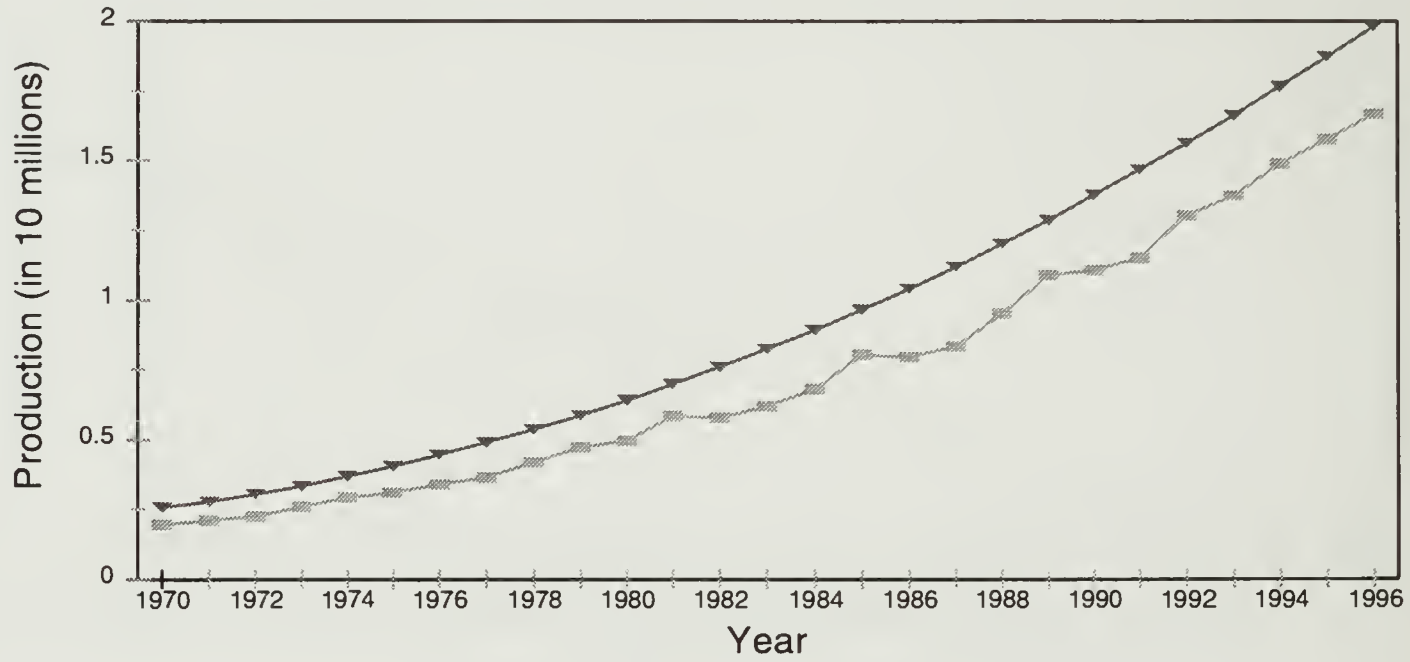
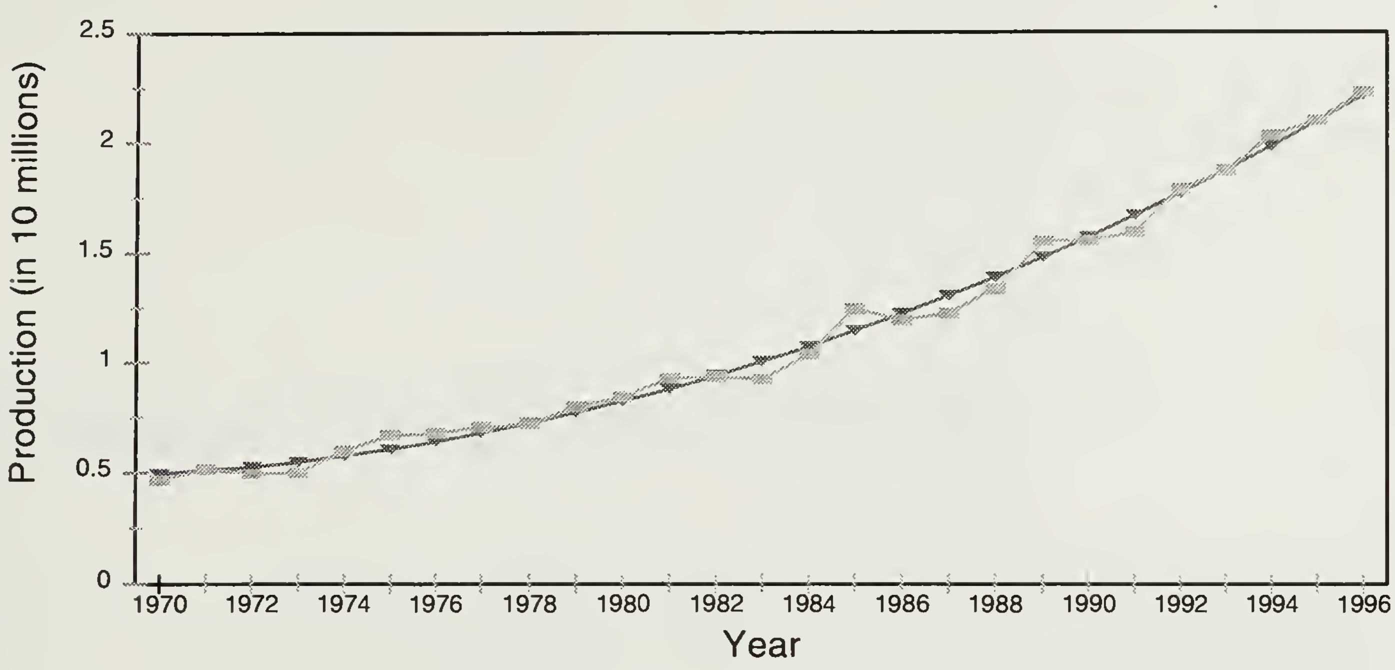


Figure 9: World Tropical Oil Production



Summary and Conclusions

The primary objective of this study is to estimate the gains from trade liberalization in the Canadian oilseed and oilseed product sector. The quantitative analysis focuses entirely on border measures, that is, the zero-for-zero proposal. The analysis suggests that under all the scenarios examined, Canada's oilseed crushers and producers would gain from trade liberalization. The exact size of these gains depends on the number of countries that participate in trade liberalization and on the size of the crushing demand elasticity in Canada. The more elastic Canada's crushing demand, the larger the gains to Canada from trade liberalization. Similarly, the more countries that participate in the trade liberalization initiative, the larger the gains to Canada's oilseed crushers and producers.

Domestic policies also influence world oilseed production and trade. However, a careful analysis of the impact of the removal of domestic policies is not possible without an evaluation of the size and the scope of these policies in less developed countries. Given the current level of support and protection provided to Canadian oilseed producers, it seems likely that further gains exist to primary oilseed producers if domestic support and protection for oilseed producers in other countries were eliminated.

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APPENDIX A: CALCULATION OF TARIFFS

Note: The material in this section was provided to the authors by AAFC. Special thanks for their efforts go to Mitch Wensley, Merritt Cluff, Hsin Huang, Chris O'Toole and Mike Corbett.

Construction of Tariffs

The 1997 applied tariff rates for oilseeds and oilseed products were collected for each of the countries in the modified AGLINK model as well as for 15 other countries that were used to construct proxy tariffs for the ROW[1]. Applied tariff rates in each country (32 in total) were collected for:

- soybeans, soyoil, soymeal
- rapeseed, rapeoil, rapemeal
- sunflower seed, sunoil, sunmeal
- palmoil

Since the AGLINK model aggregates the three major oilseeds (soybean, rapeseed and sunflower) and each of their bi-products into single commodity groups (i.e. seed, meal and oil), tariff rates had to be aggregated. In countries where the tariff applied to different seed, meal and oil types were identical, aggregation was not necessary. For those countries with different applied rates within a particular commodity group, a weighting had to be constructed.[1] This weighting was determined on the basis of average domestic consumption over the 1992 to 1995 period[2]. For example, the 1997 **applied** vegetable oil tariff for a country would be computed in the following manner:

---

[1] Initial AGLINK countries for which tariffs were collected include: Canada, Switzerland, Czechoslovakia, European Union, Hungary, Japan, Mexico, Norway, Poland, FSU (Russia proxy), Slovakia, Taiwan, Turkey, and the United States. Tariffs were also collected for Argentina, Brazil and China, for which new oilseed components were added to the AGLINK model. Countries used to construct a proxy for the ROW for which tariffs were collected include: Algeria, Bangladesh, Egypt, Indonesia, India, Korea, Malaysia, Morocco, Pakistan, Philippines, Romania, South Africa, Thailand, and Venezuela. These countries were chosen to construct the ROW proxy tariff due to their relatively high levels of vegetable oil imports and/or consumption in the ROW region.

$$OilTariff_j = \sum_{i=1992}^{1995} \frac{(sunoilt_j \times sunoilqc_{ij}) + (rapeoilt_j \times rapeoilqc_{ij}) + (soyoilt_j \times soyoilqc_{ij})}{(totaloilqc_{ij})} \times 1/4$$

t - 1997 applied tariff

qc - domestic consumption

j - country

For the 15 countries which represent the majority of oil demand in the ROW, individual applied tariffs, as calculated above, were further aggregated to construct a tariff proxy for the ROW. In this aggregation, the individual country's tariff was weighted by its proportion of total consumption (i.e. total consumption in the 15 countries) over the 1992 to 1995 period.

$$ROWOilTariff = \sum_{i=1992}^{1995} \frac{(oilt_{il} \times oilqc_{il}) + (oilt_{i2} \times oilqc_{i2}) + \ldots(oilt_{il5} \times oilqc_{il5})}{\sum_{j=1}^{15}(oilqc_{ij})} \times 1/4$$

Applied versus Effective Tariffs

While many of the countries or regions had stated applied tariffs, often the country was a net exporter of a particular oilseed commodity, indicating that the effective tariff was zero. Thus, in the individual regions represented in the AGLINK model, effective tariffs for seed, meal or oil were set to zero if the country had been a net exporter over the 1992 to 1995 period (See Table B.1 in Appendix B).

Calculation of effective tariff rates in the ROW region was complicated by the fact that the constructed tariff was an aggregation of 15 country rates (See Table B.2 in Appendix B). If a particular country had an applied tariff but exported the commodity, then that tariff had to receive a zero weighting in the ROW tariff calculation. While there were a few net seed and

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1. Countries with one or more oilseed commodity groups characterized by varied tariff rates include: Canada, China, Czechoslovakia, Egypt, Indonesia, Iran, Japan, Korea, Norway, Pakistan, Philippines, Poland, Romania, South Africa, Thailand, Turkey and the United States.
2. Both imports and consumption were considered as weights. As a highly effective tariff would result in zero imports (thus a zero weighting of that tariff), consumption was chosen as the weighting factor.

meal exporters identified in the ROW, it turned out that their applied tariffs were zero so that the resulting calculation returned effective rates equivalent to applied rates for oilseed, oilseed oil and oilseed meal[1].

The same methodology was used in calculating an effective palm oil tariff in the ROW which gave rise to an effective tariff of 14.4%[2].

Tariff Adjustments

The majority of the tariffs in the model were *ad valorem* in nature. In those cases where a specific or mixed tariff was denoted in a local currency, a conversion was carried out to represent the tariff as *ad valorem*. This was done by adjusting the fixed tariff by the $US/$domestic currency exchange rate and taking that value divided by the North West Europe price for the commodity (denoted in $US). An average tariff was constructed for the five-year period spanning 1992 to 1995.[3]

---

1. The dominant country in the ROW tariff calculations was India where high levels of seed, meal and oil consumption played a considerable role in determining the tariff levels. One major technical problem which arose was the high tariff (50%) applied to seed imports in India skewed the seed tariff for the ROW up to an unreasonable level. Since imports of seed are determined by state trading enterprises in India, the applied tariff did not reflect the effective tariff level. Using an internal seed price in a recent period, compared with the respective world price (North West Europe), an effective tariff of 15% was established.
2. Malaysia and Indonesia are large exporters of palm oil, so they drew down the level of the effective tariff on palm oil in the ROW region.
3. Countries with specific tariffs: Switzerland (all seeds, meals, and oils), Japan (oilseed oils), Norway (soyoil and rapeoil), Pakistan (soyoil and palmoil), South Africa (soybean and palmoil), Thailand (oilseed oils), United States (rapeseed, sunflower seed, oilseed meals).

APPENDIX B: TARIFF VALUES

Note: The material in this section was provided to the authors by AAFC. Special thanks for their efforts are due Mitch Wensley, Merritt Cluff, Hsin Huang, Chris O'Toole and Mike Corbett.

Table B.1: Applied and Effective Tariffs by AGLINK Region

		Net Trade	Applied Tariff	Effective Tariff		Region Status in AGLINK
		1992-95		Soy, Rape, Sun	Palm	
		(kt)	1997	(%)		
Argentina	**Oil**	2,517	10	0	10	Consumption endogenous, palm oil tariff only included -- Export Rebate 1.35%.
	Meal	8,108	6	0		Net exporter.
	Oilseed	3,247	8	0		Net exporter — Export Tax 3.5%.
Australia	**Oil**	-49	5	5	0	Consumption endogenous, oil tariff included, no palm oil consumption.
	Meal	-166	0	0		Net importer but tariff is zero.
	Oilseed	98	0	0		Net exporter.
Brazil	**Oil**	987	10	0	10	Net exporter.
	Meal	8,510	6	0		Net exporter.
	Oilseed	3,585	8	0		Net exporter.
Canada	**Oil**	401	8	0	8	Net exporter.
	Meal	299	0	0		Net exporter.
	Oilseed	2,665	0	0		Net exporter.
China	**Oil**	-939	19	19	9	Consumption endogenous, both oil and palm oil tariffs included.
	Meal	1,352	5	0		Net exporter.
	Oilseed	426	7	0		Net exporter.
Czech Republic	**Oil**	42	27	0	0	Net exporter.
	Meal	-127	0	0		Net importer but tariff is zero.
	Oilseed	32	68	0		Net exporter.

Table B.1: Applied and Effective Tariffs by AGLINK Region

		Net Trade	Applied Tariff	Effective Tariff		Region Status in AGLINK
		1992-95		Soy, Rape, Sun	Palm	
		(kt)	1997	(%)		
EU15	Oil	1,256	8	0	5	Consumption endogenous, palm oil tariff only included.
	Meal	-13,448	0	0		Net importer but tariff is zero.
	Oilseed	-16,124	0	0		Net importer but tariff is zero.
FSU	Oil	-427	15	15	5	Net importer but exogenous consumption.
	Meal	-1,076	5	5		Net importer but exogenous consumption.
	Oilseed	848	9	0		Net exporter.
Hungary	Oil	156	10	0	8	Net exporter.
	Meal	-418	6	0		Net importer but tariff is zero.
	Oilseed	124	8	0		Net exporter.
Japan	Oil	-11	23	23	5	Consumption endogenous.
	Meal	-1,052	0	0		Net importer but tariff is zero.
	Oilseed	-6,671	0	0		Net importer but tariff is zero.
Mexico	Oil	-322	10	0	10	Net importer but tariff set to zero because of NAFTA, palm oil tariff included.
	Meal	-260	15	0		Net importer but meal tariff set to zero because of NAFTA.
	Oilseed	-2,827	13	0		Net importer but seed tariff is zero.
Norway	Oil	1	0	0	0	Net exporter.
	Meal	45	0	0		Net exporter.
	Oilseed	-242	0	0		Net importer but exogenous consumption and tariff is zero.

Table B.1: Applied and Effective Tariffs by AGLINK Region

		Net Trade	Applied Tariff	Effective Tariff		Region Status in AGLINK
		1992-95		Soy, Rape, Sun	Palm	
		(kt)	1997	(%)		
Poland	Oil	-133	67	67	10	Net importer but exogenous consumption.
	Meal	11	3	3		Net exporter.
	Oilseed	107	14	0		Net exporter.
Slovakia	Oil	-2				Net importer, consumption exogenous, no tariff information.
	Meal	-50				Net importer, consumption exogenous, no tariff information.
	Oilseed	13				Net exporter.
Switzerland	Oil	-26	184	184	170	Net importer but exogenous consumption, no tariff information.
	Meal	-35	0	0		Net importer but exogenous consumption, no tariff information.
	Oilseed	-94	50	50		Net importer but exogenous consumption, no tariff information.
Turkey	Oil	-283	32	32	12	Net importer, consumption exogenous.
	Meal	-238	2	2		Net importer, consumption exogenous.
	Oilseed	-422	25	25		Net importer, consumption exogenous.
United States	Oil	643	20	0	0	Net exporter.
	Meal	4,771	3	0		Net exporter.
	Oilseed	20,644	0	0		Net exporter.
ROW* (See next table for a breakdown by country)	Oil	-3,760	18	18	14	Consumption endogenous, both oil and palm oil tariffs included.
	Meal	-7,327	6	6		Consumption endogenous tariff included.
	Oilseed	-5,824	11	11		Consumption endogenous tariff included.

Table B.2: Applied and Effective Tariffs by AGLINK Region (ROW)

ROW Regions		Net Trade	Applied Tariff	Effective Tariff		Region Status in AGLINK
		1992-95		Soy, Rape, Sun	Palm	
		(kt)	1997	(%)		
Algeria	Oil	-340	5	5	5	Net importer.
	Meal	-390	5	5		Net importer.
	Oilseed	-18	5	5		Net importer.
Bangladesh	Oil	-260	30	30	30	Net importer.
	Meal	0	0	0		No Trade.
	Oilseed	-50	8	8		Net importer.
Egypt	Oil	-237	1	1	1	Net importer.
	Meal	-464	10	10		Net importer.
	Oilseed	-103	1	1		Net importer.
Indonesia	Oil	-60	0	0	0	Net importer.
	Meal	-1,015	5	5		Net importer.
	Oilseed	-715	0	0		Net importer.
India	Oil	-200	20	20	40	Net importer.
	Meal	3,565	0	0		Net exporter.
	Oilseed	0	15	15		No Trade.
Korea	Oil	-71	8	8	3	Net importer.
	Meal	-1,559	2	2		Net importer.
	Oilseed	-1,437	1	1		Net importer.
Malaysia	Oil	65	0	0	0	Net exporter.
	Meal	-495	0	0		Net importer.
	Oilseed	-648	0	0		Net importer.

Table B.2: Applied and Effective Tariffs by AGLINK Region (ROW)

ROW Regions		Net Trade 1992-95	Applied Tariff	Effective Tariff: Soy, Rape, Sun	Effective Tariff: Palm	Region Status in AGLINK
		(kt)	1997	(%)		
Morocco	**Oil**	-245	10	10	10	Net importer.
	Meal	-52	10	10		Net importer.
	Oilseed	-79	10	10		Net importer.
Pakistan	**Oil**	-155	47	47	59	Net importer.
	Meal	-105	21	21		Net importer.
	Oilseed	-11	10	10		Net importer.
Philippines	**Oil**	-16	20	20	30	Net importer.
	Meal	-900	10	10		Net importer.
	Oilseed	-160	3	3		Net importer.
Romania	**Oil**	-45	25	25	25	Net importer.
	Meal	-275	28	28		Net importer.
	Oilseed	-125	25	25		Net importer.
South Africa	**Oil**	-258	0	0	8	Net importer.
	Meal	-165	7	7		Net importer.
	Oilseed	-200	8	8		Net importer.
Thailand	**Oil**	-11	20	20	11	Net importer.
	Meal	-830	5	5		Net importer.
	Oilseed	-426	0	0		Net importer.
Venezuela	**Oil**	-245	20	20	20	Net importer.
	Meal	-440	15	15		Net importer.
	Oilseed	-204	5	5		Net importer.

APPENDIX C: ARGENTINA OILSEED MODEL

1. OILSEED OIL CONSUMPTION

$$\log(\mathrm{ARGOLQC}/\mathrm{ARGPOP}) = -37.3292 - 0.3 * \log(\mathrm{ARGOLPP}/\mathrm{USACPI}) + 1.20 * \log(\mathrm{ARGDPI}) + 4.56519 * \log(\mathrm{TIME})$$

Note: ARGDPI is in per capita terms.

2. OILSEED OIL PRODUCTION

$$\mathrm{ARGOLQP} = \mathrm{ARGOLYLD} * \mathrm{ARGOSCR}$$

3. OILSEED OIL PRODUCER PRICE

$$\mathrm{ARGOLPP} = \mathrm{USAOLPP} * (\mathrm{ARGOLTAR} / 100 + 1.0)$$

4. OILSEED OIL EXPORTS

$$\mathrm{ARGOLEX} = \mathrm{ARGOLQP} + \mathrm{ARGOLIM} - \mathrm{ARGOLQC} + \mathrm{ARGOLST}(-1) - \mathrm{ARGOLST}$$

5. OILSEED OIL CLOSING STOCKS

$$\log(\mathrm{ARGOLST}/\mathrm{WLDOLQP}) = 354.263 - 0.4 * \log(\mathrm{E15OLWP} / (0.25 * \mathrm{E15OLWP}(-1) + 0.25 * \mathrm{E15OLWP}(-2) + 0.25 * \mathrm{E15OLWP}(-3) + 0.25 * \mathrm{E15OLWP}(-4))) - 47.226 * \log(\mathrm{TIME})$$

6. OILSEED MEAL CONSUMPTION

$$\log(\mathrm{ARGOMQC}) = 604.631 - 0.45 * \log(\mathrm{USACGWP}/\mathrm{USAWTWP}) - 1.31170 * \log(\mathrm{USAOMPP}/\mathrm{USAWTWP}) + 0.8 * \log(\mathrm{RW1NRQP}) + (1.0 - 0.8) * \log(\mathrm{RW1MKQP}) - 80.2804 * \log(\mathrm{TIME})$$

Note: ZARGOMQC included in simulations.

7. OILSEED MEAL PRODUCTION

ARGOMQP = ARGOMYLD * ARGOSCR

8. OILSEED MEAL PRODUCER PRICE

Note: Not required — no meal tariff and all prices in $US.

9. OILSEED MEAL EXPORTS

ARGOMEX = ARGOMQP + ARGOMIM - ARGOMQC + ARGOMST(-1) - ARGOMST

10. OILSEED MEAL CLOSING STOCKS

log(ARGOMST/WLDOMQP) = 785.892 - 0.2 * log(E15OMWP / (0.25 * E15OMWP(-1) + 0.25 * E15OMWP(-2) + 0.25 * E15OMWP(-3) + 0.25 * E15OMWP(-4))) - 104.032 * log(TIME)

11. OILSEED AREA HARVESTED

log(ARGOSAH) = -653.352 + 0.20 * (log(USAOSPP(-1) * (0.33 * ARGOSYLD(-1) + 0.33 * AGOSYLD(-2) + 0.33 * ARGOSYLD(-3)) / USACPI(-1) + 0.197917 * log(ARGOSAH(-1)) + 86.7883 * log(TIME)

Note: ZARGOSAH included in simulations.

12. OILSEED YIELD

log(ARGOSYLD) = -257.255 + 33.9507 * log(TIME)

13. OILSEED PRODUCTION

ARGOSQP = ARGOSAH * ARGOSYLD

14. OILSEED CRUSH

log(ARGOSCR) = -469.369 + 0.30 * log(ARGGOLPP * ARGOLYLD / USAGDPD + USAOMPP * ARGOMYLD / USAGDPD - ARGOSPP / USAGDPD) + 0.50 log(ARGOSCR(-1))+ 62.2467 * log(TIME)

Note: ZARGOSCR included in simulations.

15. OILSEED CLOSING STOCKS

log(ARGOSST/ WLDOSQP) = 689.756 - 0.2 * log(E15OSWP / (0.25 * E15OSWP(-1) + 0.25 * E15OSWP(-2) + 0.25 * E15OSWP(-3) + 0.25 * E15OSWP(-4))) - 91.218 * log(TIME)

16. OILSEED EXPORTS

ARGOSEX = ARGOSQP + ARGOSIM + ARGOSST(-1) - ARGOSST - ARGOSQC

17. OILSEED PRODUCER PRICE

ARGOSPP = USAOSPP * (ARGOSTAR / 100 + 1.0)

18. OILSEED CONSUMPTION

ARGOSQC = ARGOSFE + ARGOSFO + ARGOSCR

19. PALM OIL PRICE

Note: Not required — no palm oil consumption.

VARIABLES (ENDOGEOUS IN BOLD TYPE)	
ARGOLEX	Oilseed oil exports (kt)
ARGOLIM	Oilseed oil imports (kt)
ARGOLPP	Oilseed oil price (US$/t)
ARGOLQC	Oilseed oil consumption (kt)
ARGOLQP	Oilseed oil production (kt)
ARGOLST	Oilseed oil closing stocks (kt)
ARGOLYLD	Oilseed oil crushing yield (%)
ARGOMEX	Oilseed meal exports (kt)
ARGOMIM	Oilseed meal imports (kt)
ARGOMQC	Oilseed meal consumption (kt)
ARGOMQP	Oilseed meal production (kt)
ARGOMST	Oilseed meal closing stocks (kt)
ARGOMYLD	Oilseed oil crushing yield (%)
ARGOSAH	Oilseed area harvested (kha)
ARGOSCR	Oilseed crush (kt)
ARGOSEX	Oilseed exports (kt)
ARGOSFE	Oilseed feed use (kt)
ARGOSIM	Oilseed imports (kt)
ARGOSPP	Oilseed price (US$/kt)
ARGOSQC	Oilseed consumption (kt)
ARGOSQP	Oilseed production (kt)
ARGOSST	Oilseed closing stocks (kt)
ARGOSYLD	Oilseed yield (t/ha)
ARGPOP	Population, mid-year estimates, ‘000
ARGDPI	Gross Domestic Product per capita (real US dollars)
ARGOLTAR	Oil export tax (%)
ARGOSTAR	Oilseed export tax (%)

DATA SERIES FOR ARGDPI	
1981	1.17677
1982	1.12181
1983	1.14653
1984	1.14975
1985	1.05826
1986	1.11868
1987	1.13075
1988	1.09487
1989	1.01223
1990	1.00000
1991	1.07384
1992	1.15036
1993	1.20294
1994	1.27494
1995	1.20061

APPENDIX D: AUSTRALIA OILSEED MODULE

1. OILSEED OIL CONSUMPTION

AUSOLQC = (exp(111.725 - 0.5 * log(AUSOLPP/AUSCPI) + 0.2 * log(AUSGDPI/AUSPOP) - 14.653 * log(TIME) + log(AUSPOP)))

Note: No palm oil consumption in Australia.

2. OILSEED OIL PRICE EQUATION

AUSOLPP = (E15OLWP * (AUSXR(1) * 0.75 + AUSXR * 0.25)) * (AUSOLTAR / 100 + 1.0)

3. OILSEED CRUSH

AUSOSCR = (exp(-721.249 + 0.5 * log(AUSOLPP * AUSOLYLD / AUSGDPD + AUSOMPP * AUSOMYLD / AUSGDPD - AUSOSPP / AUSGDPD) + 0.2 * log(AUSOSCR(-1)) + 95.2852 * log(TIME) - 0.195991*D95))

AUSTRALIA – NO OILSEED STOCKS

Note: AGLINK includes a lagged price in the oil demand equation. While this might match the data, it does not seem correct in a simulation model. AGLINK also includes a palm oil price in the oil demand equation, which according to FAO data, Australia does not consume.

APPENDIX E: BRAZIL OILSEED MODULE

1. OILSEED OIL CONSUMPTION

log(BRAOLQC/BRPOP) = -190.445 - 0.3 * log(USAOLPP / USACPI) + 0.05 * log(BRAPLXP / USACPI) + 0.50 * log((BRGDPI) + 24.7128 * log(TIME)

Note: BRGDPI is in per capita terms. TIME is set equal to 1990 in simulations.

2. OILSEED OIL PRODUCTION

BRAOLQP = BRAOLYLD * BRAOSCR

3. OILSEED OIL PRODUCER PRICE

Note: Not required — assumed equal to the USA soybean oil price.

4. OILSEED OIL EXPORTS

BRAOLEX = BRAOLQP + BRAOLIM - BRAOLQC + BRAOLST(-1) - BRAOLST

5. OILSEED OIL CLOSING STOCKS

log(BRAOLST/WLDOLQP) = 10161.5 - 1.0 * log(E15OLWP / (0.25 * E15OLWP(-1) + 0.25 * E15OLWP(-2) + 0.25 * E15OLWP(-3) + 0.25 * E15OLWP(-4))) - 1338.7 * log(TIME)

Note: TIME set equal to 1985 in simulations.

6. OILSEED MEAL CONSUMPTION

log(BRAOMQC) = 1546.44 - 0.215 * log(USACGWP / USAWTWP) - 0.25 * log(USAOMPP / USAWTWP) + 2.27162 * log(RW1NRQP) - 205.938 * log(TIME)

Note: ZBRAOMQC included in simulations.

7. OILSEED MEAL PRODUCTION

BRAOMQP = BRAOMYLD * BRAOSCR

8. OILSEED MEAL PRODUCER PRICE

Note: Not required — assumed equal to the USA soybean meal price.

9. OILSEED MEAL EXPORTS

BRAOMEX = BRAOMQP + BRAOMIM - BRAOMQC + BRAOMST(-1) - BRAOMST

10. OILSEED MEAL CLOSING STOCKS

log(BRAOMST/WLDOMQP) = 436.008 - 0.2 * log(E15OMWP / (0.25 * E15OMWP(-1) + 0.25 * E15OMWP(-2) + 0.25 * E15OMWP(-3) + 0.25 * E15OMWP(-4))) - 57.9636 * log(TIME)

11. OILSEED AREA HARVESTED

log(BRAOSAH) = -329.073 + 0.35 * log(USAOSPP(-1) * (0.33 * BRAOSYLD(-1) + 0.33 * BRAOSYLD(-2) + 0.33 * BRAOSYLD(-3))) / USACPI(-1)) + 0.367497 * log(BRAOSAH(-1)) + 43.8183 * log(TIME)

12. OILSEED YIELD

log(BRAOSYLD) = -274.124 + 36.1710 * log(TIME)

13. OILSEED PRODUCTION

BRAOSQP = BRAOSAH * BRAOSYLD

14. OILSEED CRUSH

log(BRAOSCR) = -158.00 + 0.30 * log(USAOLPP * BRAOLYLD / USAGDPD + USAOMPP * USAOMYLD / USAGDPD - USAOSPP / USAGDPD) + 0.50 * log(BRAOSCR(-1)) + 21.297 * log(TIME)

Note: ZBRAOSCR included in simulations.

15. OILSEED CLOSING STOCKS

log(BRAOSST/WLDOSQP) = 685.916 - 0.5 log(E15OSWP / (0.25 * E15OSWP(-1) + 0.25 * E15OSWP(-2) + 0.25 * E15OSWP(-3) + 0.25 * E15OSWP(-4))) + 0.3409 * log(BRAOSQP) - 91.1 * log(TIME)

16. OILSEED EXPORTS

BRAOSEX = BRAOSQP + BRAOSIM + BRAOSST(-1) - BRAOSST - BRAOSQC

17. OILSEED PRODUCER PRICE

Note: Not required — assumed equal to the USA soybean price.

18. OILSEED CONSUMPTION

BRAOSQC = BRAOSFE + BRAOSFO + BRAOSCR

19. PALM OIL PRICE

BRAPLXP = MALPLXP * (BRAPLTAR / 100 + 1.0)

VARIABLES (ENDOGEOUS IN BOLD TYPE):	
BRAOLEX	Oilseed oil exports (kt)
BRAOLIM	Oilseed oil imports (kt)
BRAOLQC	Oilseed oil consumption (kt)
BRAOLQP	Oilseed oil production (kt)
BRAOLST	Oilseed oil closing stocks (kt)
BRAOLYLD	Oilseed oil crushing yield (%)
BRAOMEX	Oilseed meal exports (kt)
BRAOMIM	Oilseed meal imports (kt)
BRAOMQC	Oilseed meal consumption (kt)
BRAOMQP	Oilseed meal production (kt)
BRAOMST	Oilseed meal closing stocks (kt)
BRAOMYLD	Oilseed oil crushing yield (%)
BRAOSAH	Oilseed area harvested (kha)
BRAOSCR	Oilseed crush (kt)
BRAOSEX	Oilseed exports (kt)
BRAOSFE	Oilseed feed use (kt)
BRAOSIM	Oilseed imports (kt)
BRAOSQC	Oilseed consumtion (kt)
BRAOSQP	Oilseed production (kt)
BRAOSST	Oilseed closing stocks (kt)
BRAOSYLD	Oilseed yield (t/ha)
BRAPOP	Population, mid-year estimates, ‘000
BRGDPI	Gross Domestic Product per capita (real US dollars)
BRAPLTAR	Palm oil tariff (%)

BRGDPI	
1981	0.98138
1982	0.96513
1983	0.91188
1984	0.94054
1985	0.99465
1986	1.05734
1987	1.07213
1988	1.05030
1989	1.06607
1990	1.00001
1991	0.98935
1992	0.96270
1993	0.99148
1994	1.03450
1995	1.05103

APPENDIX F: CANADA OILSEED MODULE

1. OILSEED OIL CONSUMPTION

CANOLQC = (exp(-395.395 - 0.35 * log(CANOLPP / CANCPI) + 0.1 * log(CANPLPP / CANCPI) + 0.10 * log(CANBTWP / CANCPI) + 0.5 * log(CANGDPI / CANPOP) + 52.4209 * log(TIME) + 0.216427 * D95 + log(CANPOP)))

2. OILSEED CRUSH

CANOSCR = (exp(-174.300 + 0.5 * log(CANOLPP * CANOLYLD / CANGDPD + CANOMPP * CANOMYLD / CANGDPD - CANOSPP / CANGDPD) + 0.5 * log(CANOSCR(-1)) + 23.1982 * log(TIME) - 0.00222845 * D95))

3. OILSEED OIL CLOSING STOCKS

CANOLST = (exp(-6.75396 - 1.0 * log(E15OLWP / (0.25 * E15OLWP(-1) + 0.25 * E15OLWP(-2) + 0.25 * E15OLWP(-3) + 0.25 * E15OLWP(-4))) + log(WLDOLQP)))

4. OILSEED MEAL CLOSING STOCKS

CANOMST = (exp(-7.69239 - 0.2 * log(E15OMWP / (0.25 * E15OMWP(-1) + 0.25 * E15OMWP(-2) + 0.25 * E15OMWP(-3) + 0.25 * E15OMWP(-4))) + log(WLDOMQP)))

5. OILSEED CLOSING STOCKS

CANOSST = (exp(602.185 - 0.5 * log(E15OSWP / (0.25 * E15OSWP(-1) + 0.25 * E15OSWP(-2) + 0.25 * E15OSWP(-3) + 0.25 * E15OSWP(-4))) - 79.9687 * log(TIME) + log(WLDOSQP)))

6. PALM OIL PRICE

CANPLPP = (MALPLXP * CANXR) * (CANPLTAR / 100 + 1)

Note: Tariff is 8.8% declining to 6.4%.

APPENDIX G: CHINA OILSEED MODULE

1. OILSEED OIL CONSUMPTION

$$\log(\mathrm{CHOLQC}/\mathrm{CHPOP}) = -5.5386 - 0.20 \log(\mathrm{CHOLWP} / \mathrm{USACPI}) + 0.05 \log(\mathrm{CHPLXP} / \mathrm{USACPI}) + 0.1 \log(\mathrm{WLDBTWP} / \mathrm{USACPI}) + 0.47457 \log(\mathrm{CHGDPI})$$

Note: ZCHOLQC included in simulations.

2. OILSEED OIL PRODUCTION

$$\mathrm{CHOLQP} = \mathrm{CHOLYLD} * \mathrm{CHOSCR}$$

3. OILSEED OIL EXPORTS

$$\mathrm{CHOLEX} = \mathrm{CHOLQP} + \mathrm{CHOLIM} - \mathrm{CHOLQC} + \mathrm{CHOLST}(-1) - \mathrm{CHOLST}$$

4. OILSEED OIL CLOSING STOCKS

Note: Exogenous.

5. OILSEED MEAL CONSUMPTION

$$\log(\mathrm{CHOMQC}) = 1425.65 + 0.50 * \log(\mathrm{USACGWP} / \mathrm{USAWTWP}) - 0.25 * \log(\mathrm{E15OMWP} / \mathrm{USAWTWP}) + 0.8 * \log(\mathrm{CHNRQP}) + 0.2 * \log(\mathrm{CHRUQP}) - 188.8 \log(\mathrm{TIME}) + 0.7525 \log(\mathrm{CHOMQC}(-1))$$

Note: TIME = (TIME-7) and ZCHOMQC is included in simulations.

6. OILSEED MEAL PRODUCTION

$$\mathrm{CHOMQP} = \mathrm{CHOMYLD} * \mathrm{CHOSCR}$$

7. OILSEED MEAL EXPORTS

CHOMEX = CHOMQP + CHOMIM - CHOMQC + CHOMST(-1) - CHOMST

8. OILSEED MEAL CLOSING STOCKS

Note: Exogenous.

9. OILSEED AREA HARVESTED

log(CHOSAH) = -289.601 + 0.20 * log(E15OSWP(-1) * (.33*CHOSYLD(-1) + 0.33 * CHOSYLD(-2) + 0.33 * CHOSYLD(-3)) / USACPI(-1)) + 0.281 * log(CHOSAH(-1)) + 38.8782 * log(TIME)

Note: ZCHOSAH included in simulations.

10. OILSEED YIELD

log(CHOSYLD) = -259.087 + 34.1522 * log(TIME)

11. OILSEED PRODUCTION

CHOSQP = CHOSAH * CHOSYLD

12. OILSEED CRUSH

log(CHOSCR) = -211.931 + 0.30 * log(CHOLPP * CHOLYLD / USAGDPD + USAOMPP * CHOMYLD / USAGDPD - USAOSPP / USAGDPD) + 0.50 log(CHOSCR(-1)) + 28.355 * log(TIME)

13. OILSEED CLOSING STOCKS

Note: Exogenous.

14. OILSEED EXPORTS

CHOSEX = CHOSQP + CHOSIM + CHOSST(-1) - CHOSST - CHOSQC

15. OILSEED CONSUMPTION

CHOSQC = CHOSFE + CHOSFO + CHOSCR

16. PALM OIL PRICE

CHPLXP = MALPLXP * (CHPLTAR / 100 + 1.0)

17. NON-RUMINANT PRODUCTION

$\log(CHNRQP) = -1.70812 + 1.121 \log(RW1NRQP)$

18. RUMINANT PRODUCTION

$\log(CHRUQP) = -16.6 + 2.32 \log(RW1MKQP)$

Note: This equation was synthesized, not estimated.

19. OILSEED OIL PRICE

$CHOLPP = E15OLWP * (CHOLTAR / 100 + 1.0)$

VARIABLES (ENDOGEOUS IN BOLD TYPE)	
CHOLEX	Oilseed oil exports (kt)
CHOLIM	Oilseed oil imports (kt)
CHOLPP	Oilseed oil price (US$/t)
CHOLQC	Oilseed oil consumption (kt)
CHOLQP	Oilseed oil production (kt)
CHOLST	Oilseed oil closing stocks (kt)
CHOLYLD	Oilseed oil crushing yield (%)
CHOMEX	Oilseed meal exports (kt)
CHOMIM	Oilseed meal imports (kt)
CHOMQC	Oilseed meal consumption (kt)
CHOMQP	Oilseed meal production (kt)
CHOMST	Oilseed meal closing stocks (kt)
CHOMYLD	Oilseed oil crushing yield (%)
CHOSAH	Oilseed area harvested (kha)
CHOSCR	Oilseed crush (kt)
CHOSEX	Oilseed exports (kt)
CHOSFE	Oilseed feed use (kt)
CHOSIM	Oilseed imports (kt)
CHOSQC	Oilseed consumption (kt)
CHOSQP	Oilseed production (kt)
CHOSST	Oilseed closing stocks (kt)
CHOSYLD	Oilseed yield (t/ha)
CHPOP	Population, mid-tear estimates, ‘000
CHGDPI	Per capita GNP, real US dollars

Note: Equations were estimated before adding the oil tariff and the estimates were based on USAOLPP.

CHGDPI	
1981	0.49867
1982	0.53113
1983	0.57713
1984	0.65614
1985	0.73683
1986	0.79065
1987	0.86954
1988	0.95421
1989	0.97814
1990	1.00000
1991	1.07991
1992	1.22265
1993	1.37661
1994	1.53883
1995	1.69084

APPENDIX H: EUROPEAN UNION OILSEED MODULE

1. OILSEED OIL CONSUMPTION

E15OLFO = (exp(144.324 - 0.5 * log(E15OLPP / E15CPI) + 0.2 * log(E15PLPP / E15CPI) + 1.0 * log(E15GDPI / E15POP) - 17.6331 * log(TIME) + 0.087738 * D95 + log(E15POP)))

2. PALM OIL PRICE EQUATION

E15PLPP = (MALPLXP * E15XR) * (E15PLTAR / 100 + 1)

Note: Tariff is 5.6%, declining to 3.8%.

3. OILSEED OIL CLOSING STOCKS

E15OLST = (exp(-3.91142 - 0.5 * log(E15OLWP / (0.25 * E15OLWP(-1) + 0.25 * E15OLWP(-2) + 0.25 * E15OLWP(-3) + 0.25 * E15OLWP(-4))) + log(WLDOLQP)))

4. OILSEED MEAL CLOSING STOCKS

E15OMST = (exp(160.545 - 0.2 * log(E15OMWP / (0.25 * E15OMWP(-1) + 0.25 * E15OMWP(-2) + 0.25 * E15OMWP(-3) + 0.25 * E15OMWP(-4))) - 21.4103 * log(TIME) + 0.5325 * log(E15OMST(-1) / WLDOMQP(-1)) + log(WLDOMQP)))

5. OILSEED CLOSING STOCKS-

E15OSST = (exp(2714 - 1.0 * log(E15OSWP / (0.25 * E15OSWP(-1) + 0.25 * E15OSWP(-2) + 0.25 * E15OSWP(-3) + 0.25 * E15OSWP(-4))) + 2.0986 * log(E15OSQP) - 360.56 * log(TIME) + log(WLDOSQP)))

APPENDIX I: JAPAN OILSEED MODULE

1. OILSEED OIL DEMAND

JPNOLQC = (exp(284.691 - 0.2 * log(JPNOLPP / JPNCPI) + 0.05 * log(JPNBTSP / JPNCPI) + 0.6 * log(JPNGDPI / JPNPOP) + - 37.0561 * log(TIME) + 0.078101 * D95 + log(JPNPOP)))

Note: There is no palm oil consumption in Japan.

2. OILSEED OIL PRICE

JPNOLPP = (((0.5 * E15OLWP + 0.5 * E15OLWP(-1)) / 1000) * (JPNXR * 0.75 + JPNXR(1) * 0.25)) + JPNOLTAR

Note: This is the existing equation in AGLINK and is included for information purposes only.

3. OILSEED CRUSH

JPNOSCR = (exp(35.1812 + 0.3 * log(JPNOLPP * JPNOLYLD / JPNGDPD + JPNOMPP * JPNOMYLD / JPNGDPD - JPNOSPP / JPNGDPD) + 0.5 * log(JPNOSCR(-1)) - 4.12095 * log(TIME) - 0.070639 * D95))

4. OILSEED OIL CLOSING STOCKS

JPNOLST = (exp(-5.44215 - 0.2 * log(E15OLWP / (0.25 * E15OLWP(-1) + 0.25 * E15OLWP(-2) + 0.25 * E15OLWP(-3) + 0.25 * E15OLWP(-4))) + log(WLDOLQP)))

5. OILSEED MEAL CLOSING STOCKS

JPNOMST = (exp(1380.84 - 0.2 * log(E15OMWP / (0.25 * E15OMWP(-1) + 0.25 * E15OMWP(-2) + 0.25 * E15OMWP(-3) + 0.25 * E15OMWP(-4))) + 8.10092 * log(JPNOMQP) - 191.463 * log(TIME) + log(WLDOMQP)))

Note: TIME is set equal to 1990 in simulations.

6. OILSEED CLOSING STOCKS

JPNOSST = (exp(-304.349 - 0.2 * log(E15OSWP / (0.25 * E15OSWP(-1) + 0.25 * E15OSWP(-2) + 0.25 * E15OSWP(-3) + 0.25 * E15OSWP(-4))) + 0.16058 * log(JPNOSQP) + 39.3167 * log(TIME) + log(WLDOSQP)))

APPENDIX J: MEXICO OILSEED MODULE

1. OILSEED OIL CONSUMPTION

MEXOLQC = (exp(-199.025 - 0.95 * log(MEXOLPP / MEXCPI) + 0.2 * log(MEXPLPP / MEXCPI) + 0.05 * log(MEXBFPP / MEXCPI) + 0.05 * log(MEXPKPP / MEXCPI) + 0.05 * log(MEXPTPP / MEXCPI) + 0.25 * log(MEXGDPI / MEXPOP) + 26.5594 * log(TIME) + 0.135772 * D95 + log(MEXPOP)))

2. PALM OIL PRICE

MEXPLPP = (MALPLXP * MEXXR) * (MEXPLTAR / 100 + 1)

Note: Tariff is 10% and is held at 10% in base simulation.

3. CRUSH DEMAND

Note: Exogenous.

4. STOCK DEMAND

Note: Exogenous.

APPENDIX K: ROW OILSEED MODULE

1. OILSEED OIL CONSUMPTION

$$\log(\mathrm{RWOLQC}/\mathrm{RWPOP}) = 6.19841 - 0.2475 * \log(\mathrm{RWOLWP} / \mathrm{USACPI}) + 0.1784 * \log(\mathrm{RWPLXP} / \mathrm{USACPI}) + 0.7661 \log(\mathrm{RW1GDPI} / \mathrm{RW1POP})$$

Note: ZRWOLQC included in simulations.

2. OILSEED OIL PRODUCTION

$$\mathrm{RWOLQP} = \mathrm{RWOLYLD} * \mathrm{RWOSCR}$$

3. OILSEED OIL NET EXPORTS

$$\mathrm{RWOLNT} = \mathrm{RWOLQP} - \mathrm{RWOLQC} + \mathrm{RWOLST}(-1) - \mathrm{RWOLST}$$

4. OILSEED OIL CLOSING STOCKS

$$\log(\mathrm{RWOLST}/\mathrm{WLDOLQP}) = 852.436 - 0.3 * \log(\mathrm{E15OLWP} / (0.25 * \mathrm{E15OLWP}(-1) + 0.25 * \mathrm{E15OLWP}(-2) + 0.25 * \mathrm{E15OLWP}(-3) + 0.25 * \mathrm{E15OLWP}(-4))) + 0.4408 * \log(\mathrm{RWOLQP}) - 113.08 * \log(\mathrm{TIME}) + 0.297 * \log(\mathrm{RWOLST}(-1) / \mathrm{WLDOLQP}(-1))$$

5. OILSEED MEAL CONSUMPTION

$$\log(\mathrm{RWOMQC}) = -263.74 - 0.215 * \log(\mathrm{USACGWP} / \mathrm{USAWTWP}) - 0.25 * \log(\mathrm{RWOMWP} / \mathrm{USAWTWP}) + 0.8 * \log(\mathrm{RW1NRQP}) + (1.0 - 0.8) * \log(\mathrm{RW1MKQP}) + 34.5106 * \log(\mathrm{TIME})$$

6. OILSEED MEAL PRODUCTION

$$\mathrm{RWOMQP} = \mathrm{RWOMYLD} * \mathrm{RWOSCR}$$

7. OILSEED MEAL NET EXPORTS

RWOMNT = RWOMQP - RWOMQC + RWOMST(-1) - RWOMST

8. OILSEED MEAL CLOSING STOCKS

log(RWOMST/WLDOMQP) = -1004.48 - 0.2 * log(E15OMWP / (0.25 * E15OMWP(-1) + 0.25 * E15OMWP(-2) + 0.25 * E15OMWP(-3) + 0.25 * E15OMWP(-4))) + 131.64 * log(TIME)

9. OILSEED AREA HARVESTED

log(RWOSAH) = -653.532 + 0.20 * log(RWOSWP(-1) * (0.33 * RWOSYLD(-1) + 0.33 * RWOSYLD(-2) + 0.33 * RWOSYLD(-3)) / USACPI(-1)) + 0.3473 * log(RWOSAH(-1)) + 86.732 log(TIME)

10. OILSEED YIELD

log(RWOSYLD) = -183.923 + 24.2099 log(TIME)

11. OILSEED PRODUCTION

RWOSQP = RWOSAH * RWOSYLD

12. OILSEED CRUSH

log(RWOSCR) = -487.228 + 0.30 log(RWOLWP * RWOLYLD / USAGDPD + RWOMWP * RWOMYLD / USAGDPD - RWOSWP / USAGDPD) + 0.50 log(RWOSCR(-1)) + 64.630 * log(TIME)

13. OILSEED CLOSING STOCKS

log(RWOSST/RWOSQP) = 2855.93 - 0.2 * log(E15OSWP / (0.25 * E15OSWP(-1) + 0.25 * E15OSWP(-2) + 0.25 * E15OSWP(-3) + 0.25 * E15OSWP(-4))) + 2.684 * log(RWOSQP) - 380.09 * log(TIME)

14. OILSEED NET EXPORTS

RWOSNT = RWOSQP + RWOSST(-1) - RWOSST - RWOSQC

15. OILSEED CONSUMPTION

RWOSQC = RWOSFE + RWOSFO + RWOSCR

16. PALM OIL PRICE

RWPLXP = MALPLXP * (RWPLTAR / 100 + 1.0)

17. OIL PRICE EQUATION

$$\mathrm{RWOLPP} = \mathrm{E15OLWP} * (\mathrm{RWOLTAR} / 100 + 1.0)$$

18. MEAL PRICE EQUATION

$$\mathrm{RWOMPP} = \mathrm{E15OMWP} * (\mathrm{RWOMTAR} / 100 + 1.0)$$

19. SEED PRICE EQUATION

$$\mathrm{RWOSPP} = \mathrm{E15OSWP} * (\mathrm{RWOSTAR} / 100 + 1.0)$$

Note: When the model was estimated, the oil and meal equations used European Union prices in those equations, and the crush equation used USA prices. When the model was simulated, the tariffs on oil, meal and seed were added and the crushing margin changed to use European Union prices plus $50 to keep the margin from being negative.

VARIABLES (ENDOGEOUS IN BOLD TYPE)	
RWOLEX	Oilseed oil exports (kt)
RWOLIM	Oilseed oil imports (kt)
RWOLPP	Oilseed oil price (US$/t)
RWOLQC	Oilseed oil consumption (kt)
RWOLQP	Oilseed oil production (kt)
RWOLST	Oilseed oil closing stocks (kt)
RWOLYLD	Oilseed oil crushing yield (%)
RWOMEX	Oilseed meal exports (kt)
RWOMIM	Oilseed meal imports (kt)
RWOMPP	Oilseed meal price(US$/t)
RWOMQC	Oilseed meal consumption (kt)
RWOMQP	Oilseed meal production (kt)
RWOMST	Oilseed meal closing stocks (kt)
RWOMYLD	Oilseed oil crushing yield (%)
RWOSAH	Oilseed area harvested (kha)
RWOSCR	Oilseed crush (kt)
RWOSEX	Oilseed exports (kt)
RWOSFE	Oilseed feed use (kt)
RWOSIM	Oilseed imports (kt)
RWOSPP	Oilseed price (US$/t)
RWOSQC	Oilseed consumption (kt)
RWOSQP	Oilseed production (kt)
RWOSST	Oilseed closing stocks (kt)
RWOSYLD	Oilseed yield (t/ha)
RWPOP	Population, mid-tear estimates, ‘000
RW1GDPI	GDP in old RW1 region (real US dollars)
RW1pop	Population, mid-year estimates, `000 old RW1 region
RWOLTAR	Oil tariff (%)
RWOMTAR	Meal tariff (%)
RWOSTAR	Seed tariff (%)

RW1GDPI	
1981	0.80460
1982	0.82100
1983	0.85820
1984	0.90030
1985	0.92840
1986	0.97470
1987	1.00000
1988	1.07130
1989	1.11010
1990	1.14440
1991	1.17730
1992	1.22420
1993	1.28150
1994	1.35350
1995	1.41950

APPENDIX L: UNITED STATES OILSEED MODULE

1. OILSEED OIL CONSUMPTION

USAOLQC = (exp(-179.414 - 0.3 * log(USAOLPP / USACPI) + 0.05 * log(MALPLXP / USACPI) + 0.4 * log(USAGDPI / USAPOP) + 23.9856 * log(TIME) + -0.012078 * D95 + log(USAPOP)))

2. CRUSH DEMAND

USAOSCR = (exp(-20.8145 + 0.5 * log(USAOMPP * USAOMYLD / USAGDPD + USAOLPP * USAOLYLD / USAGDPD - USAOSPP / USAGDPD) + 0.5 * log(USAOSCR(-1)) + 3.18123 * log(TIME) - 0.067458 * D95))

3. OILSEED OIL CLOSING STOCKS

USAOLST = (exp(-485.506 - 0.8 * log(E15OLWP / (0.25 * E15OLWP(-1) + 0.25 * E15OLWP(-2) + 0.25 * E15OLWP(-3) + 0.25 * E15OLWP(-4))) + 63.6471 * log(TIME) + 0.5508 * log(USAOLST(-1) / WLDOLQP(-1)) + log(WLDOLQP)))

4. OILSEED MEAL CLOSING STOCKS

USAOMST = (exp(673.031 - 0.5 * log(E15OMWP / (0.25 * E15OMWP(-1) + 0.25 * E15OMWP(-2) + 0.25 * E15OMWP(-3) + 0.25 * E15OMWP(-4))) - 89.4090 * log(TIME) + log(WLDOMQP)))

5. OILSEED CLOSING STOCKS

USAOSST = (exp(862.034 - 1.171 * log(E15OSWP / (0.25 * E15OSWP(-1) + 0.25 * E15OSWP(-2) + 0.25 * E15OSWP(-3) + 0.25 * E15OSWP(-4))) + 1.03939 * log(USAOSQP) - 115.298 * log(TIME) + 0.2056 * log(USAOSST(-1) / WLDOSQP(-1)) + log(WLDOSQP)))

APPENDIX M: PALM OIL MODULE

1. WORLD DEMAND FOR PALM OIL

$$\mathrm{WLDPLQC} = \mathrm{A} - \mathrm{B} * (\mathrm{MALPLXP} * (1 + \mathrm{TARPL}) / \mathrm{USACPI}) + \mathrm{C} * (\mathrm{E15OLWP} * (1 + \mathrm{TAROL}) / \mathrm{USACPI}) + \mathrm{D} * (\mathrm{RW1GDPIUS} / \mathrm{RW1POP})$$

2. WORLD SUPPLY IS COMPLETELY INELASTIC IN THE CURRENT TIME PERIOD

$$\mathrm{WLDPLQP} = \overline{\mathrm{WLDPLQP}}$$

3. MARKET CLEARING

$$\mathrm{WLDPLQC} = \overline{\mathrm{WLDPLQP}}$$

Reduced form of the above:

$$\mathrm{A} - \mathrm{B} * (\mathrm{MALPLXP}\ (1 + \mathrm{TARPL}) / \mathrm{USACPI}) + \mathrm{C} * (\mathrm{E15OLWP} * (1 + \mathrm{TAROL}) / \mathrm{USACPI}) + \mathrm{D} * (\mathrm{RW1GDPIUS} / \mathrm{RW1POP}) = \overline{\mathrm{WLDPLQP}}$$

Rearranging gives:

$$\mathrm{MALPLXP} * (1 + \mathrm{TARPL}) / \mathrm{USACPI} = (1 / \mathrm{B})\ (\mathrm{A} + \mathrm{C} * (\mathrm{E15OLWP} * (1 + \mathrm{TAROL}) / \mathrm{USACPI}) + \mathrm{D} * (\mathrm{RW1GDPIUS} / \mathrm{RW1POP}) - \mathrm{WLDPLQP}$$

This estimated equation, along with an endogenous supply curve, can be used to simulate the world market clearing price for palm oil.

Palm oil prices in individual countries/regions are linked to the world palm oil price adjusted by the relevant tariff as shown in the individual country models.

1. PALM OIL PRICE REDUCED FORM EQUATION

MALPLXP = ((-9.947 + 1.00 * (E15OLWP * (WLDOLTAR / 100 + 1)) - 0.00281 * WLDPLQP) / (WLDPLTAR / 100 + 1.0))

2. PALM OIL SUPPLY EQUATION

WLDPLQP = -950957 + 1.698 * (MALPLXP(-1) / USACPI(-1)) + 0.445 * WLDPLQP(-1) + 480.85 * TIME

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